THE JOURNAL OF GAS LIGHTING
WATER SUPPLY & SANITARY IMPROVEMENT

VOL. LIX. No. 1517.] LONDON, JUNE 7, 1892. [44TH YEAR. PRICE 6d.

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STRAINS IN STRUCTURES CONNECTED WITH GAS-WORKS.
BY
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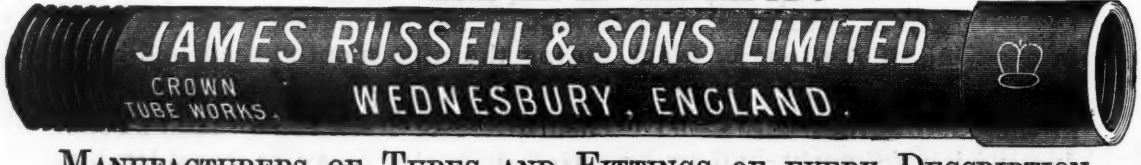

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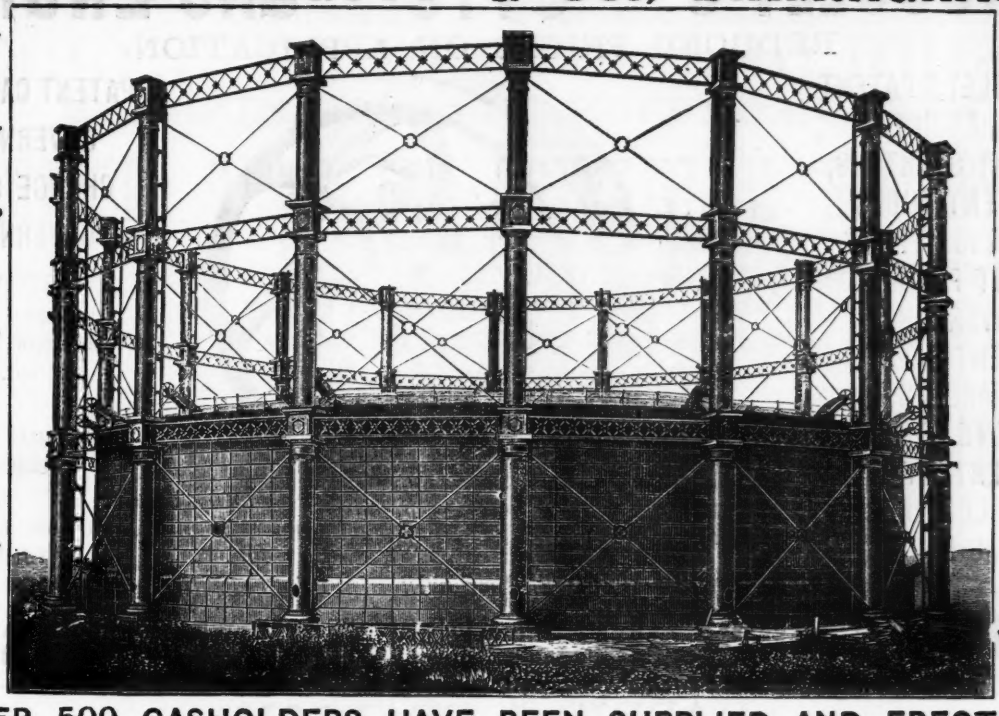

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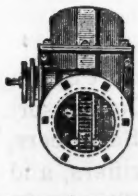

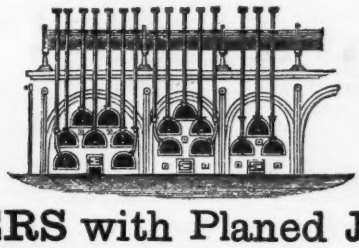

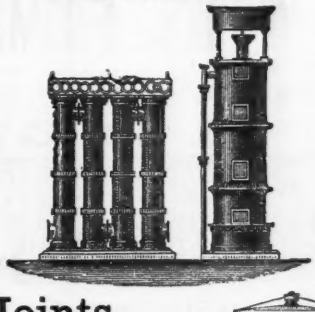

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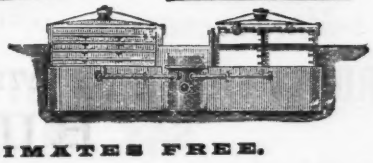

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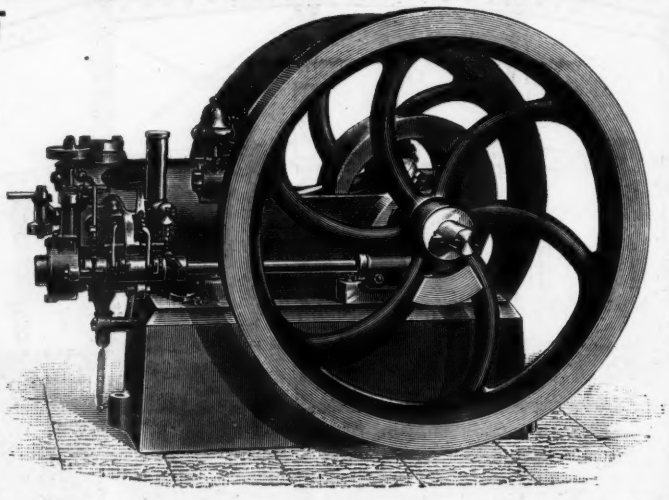

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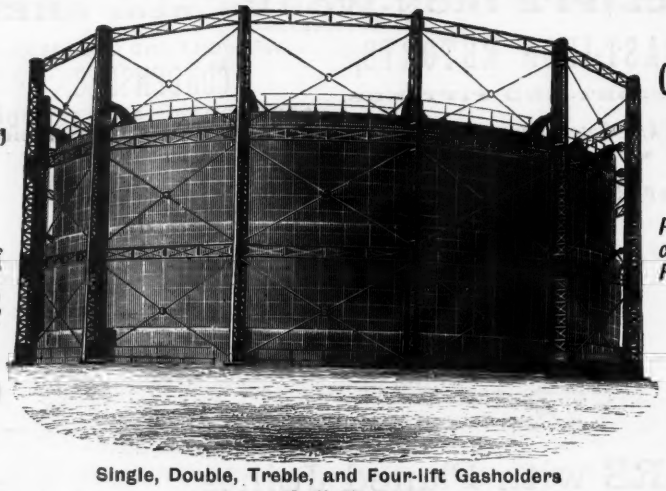

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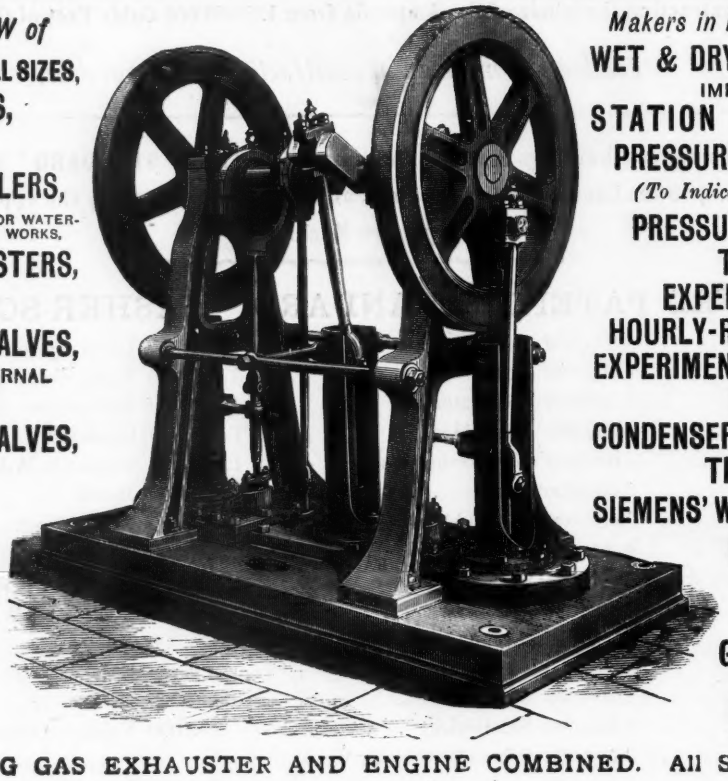

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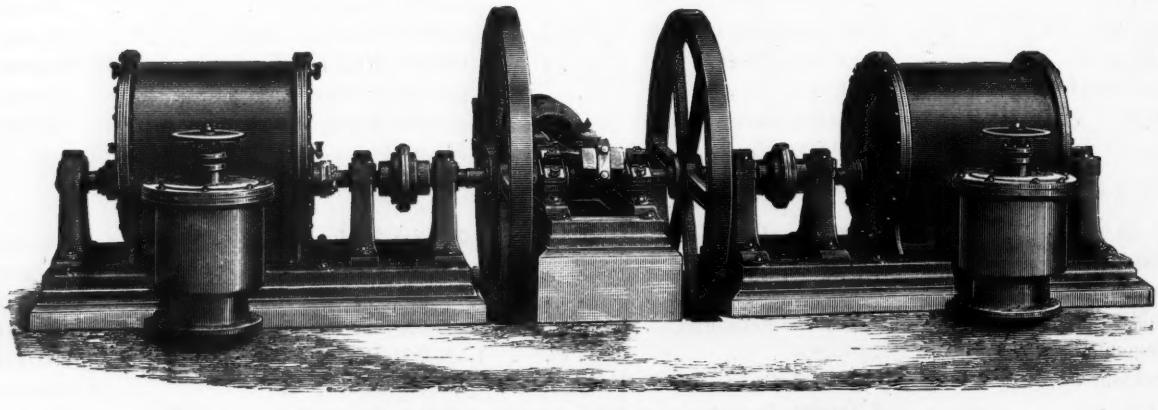

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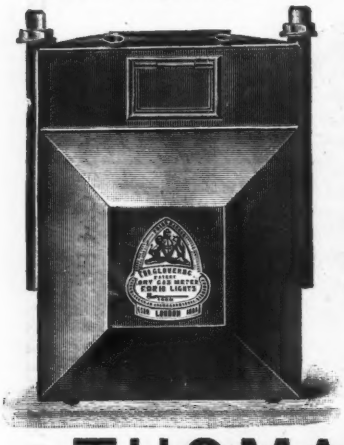

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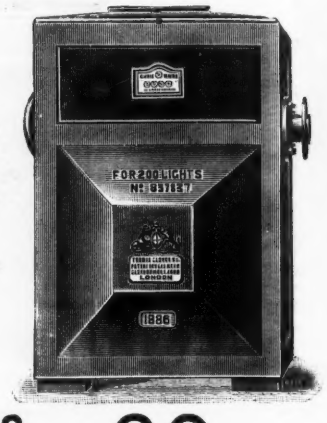

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TO CORRESPONDENTS.

No notice can be taken of anonymous communications. Whatever is intended for insertion must be authenticated by the name and address of the writer; not necessarily for publication, but as a proof of good faith.

THE

JOURNAL OF GAS LIGHTING,

WATER SUPPLY, & SANITARY IMPROVEMENT.

TUESDAY, JUNE 7, 1892.

The Gas Industry Before the Labour Commission.

THE continuation of the evidence relating to the gas industry given before the Royal Commission will be found in another column; and there is more to report next week. Some interesting matter came out of the examination of Charles Wheeler, who spoke for the Beckton coalies. In most of the working-men witnesses who have told their tale before the Commission, it is easy to discover two voices—one with which they usually begin their story, and which is the studied, conventional voice, while the other is only heard when the speaker's real convictions are reached by a searching question or two across the table. Wheeler was like the rest in this respect. He came prepared to tell a smooth tale, and to express a formal distaste for strikes and all similar unpleasantnesses, which he was ready to ascribe to "misunderstandings" between employers and employed. After this had all been duly placed upon record, Mr. Livesey took the witness in hand, and made him confess to a variety of performances by the Union men working at Beckton which can hardly be explained away as the result of any misunderstanding between employer and employed. There is very little "misunderstanding" about a refusal of coalies to discharge a vessel which happens to be boycotted by order of the Seamen and Firemen's Union. Of course, Wheeler is saturated with crude views about the necessity for an eight hours' day—for other occupations than his own—and various other Social Democratic fads for "taking up the surplus labour." All the Union leaders, from Thorne downwards, have become warped by association with talkers and writers of the Aveling stamp, who never did a day's handiwork in their lives; and consequently their minds are muddled over obscure points of industrial, economic, and social polity, the rights of which neither they nor anybody else can ever hope to understand. If such men would but confine their attention to matters about which they may be supposed to know something—for instance, the organization of their own labour, the redress of grievances, and the improvement of members of their own order in reliability, steadiness, and the sense of responsible citizenship—they would do more good in the world than all the German dreamers and French fanatics ever did or ever can effect.

Mr. W. A. Valon, the President of the Incorporated Gas Institute, was the first of the band of witnesses before the Commission who authoritatively represented the gas industry. Mr. Valon, acting in his official capacity as head of The Gas Institute, has got together, at vast pains and labour, a valuable and interesting mass of evidence illustrating the conditions of labour in 110 gas-works situated in different parts of the United Kingdom, outside the Metropolis, and dealing with 13,510 men. This material Mr. Valon has analyzed and arranged with a view to bringing out many salient facts, which will be found in the report of his evidence, and which deserve the careful study of all works' managers and directors, whether contributories to the stock of information or not. One observation we must offer upon Mr. Valon's returns; and it is this: There is more inequalitity than we should have expected between the rates of wages paid to stokers in different places; and it would have been more satisfactory, in the interest of clearness, if at the same time it had been explained what is done for the money. There is reason to believe, as Mr. Valon himself says, that on the whole the men employed in gas making are as well paid as in most other manufactories, and better than in a great many. It would be a shame and disgrace to the proprietors of such protected establishments if anything could be proved to the contrary, in a general way. But it is impossible to regard all Mr. Valon's returns as equally satisfactory. We fear that in too many instances, even among those undertakings which have given information concerning their system of works' management—and the number will naturally be increased by many from which no returns have been supplied—the arrangements as to necessary leisure time, Sunday work, holiday pay, and so forth, are not as they should be. It can hardly be wondered at if a black mark is put against these backward establishments by those who know them. Mr. Valon publishes no names, nor any details which may lead to the identification of the works to which his returns apply. But we urge upon the directors or the committeemen, whoever they may be, of these lagging undertakings to seriously consider their position in the light of what is done in other places, and to ask themselves whether they are content to figure as harder task-masters than their fellows. This is a charge that comes home to every gas director—nay, to every shareholder having a voice in the general meeting of the company, and to every ratepayer in whose name a corporation gas undertaking is administered by the local authority. It is the supreme powers who are really responsible in this matter, not their agent, the works' manager, whose hands are often tied by want of means, short storeage room, and other considerations. Directorial apathy is the obstacle in the way of amelioration in most cases of unsatisfactory labour conditions; and it is a pity that, where this exists, the offenders cannot be pilloried.

Mr. Valon explained to the Commission how he is able to arrange for his Ramsgate hands to have one complete day's rest in seven. The plan is undoubtedly a good one;

but it is not to be lightly conceded that any week-day is an equivalent for the Sunday. It does not appear that the Commissioners were greatly impressed with this Ramsgate plan. Mr. Valon had another suggestion for the establishment by statute of a General Superannuation Fund for gas-workers, the object of which, as he stated it, would be to remedy the weakness of the bonus or other pension systems in existence in being confined to individual works, generally large ones. Under the suggested plan, it was pleaded by the witness that the removal of a man from one works to another would not interfere with the amount of claim he would eventually have upon the general fund. But are such removals so general as to demand special provision for the protection of those engaging in the practice; and is the "rolling stone" kind of workman particularly worthy of so much attention? To Mr. Livesey, the witness confessed his dislike of, and disbelief in, profit-sharing, which he professed to be unable to distinguish from a variety of wage-paying. On the subject of the prevention and settlement of labour disputes, Mr. Valon expressed himself as favourable to the constitution of Joint Boards of Arbitration or Conciliation fairly representing both parties; but when pressed as to how such a Board could enforce its awards upon a revolted minority, he failed (like everybody else) to solve the insoluble; and so the idea remains a mere "pious opinion." Mr. Valon certainly deserved the thanks he received from the Chairman of the Section for his evidence, which must have cost him a great deal of trouble; and although work of this kind is perhaps to some extent a "labour of love" to men like the President of The Gas Institute, a busy engineer has plenty to do besides attending Royal Commissions for honour and glory.

The End of the Durham Strike.

At last, after more weary weeks of sullen resistance to the inevitable than one likes to count, the strike of the Durham miners has come to an end. The precipitant in this matter was the Bishop of Durham; and his Right Reverend Lordship has been awarded unlimited *kudos* for the part he has played in bringing to an end one of the most disastrous industrial wars of modern times. We have no desire to rob Bishop Westcott of any portion of the glory which may be truly ascribed to him in connection with this matter. Indeed, his Lordship's goodwill towards both parties in the strife, and his desire for a happy termination to this deplorable dissension, have been prominent throughout. If the Bishop could have had his way, the strike would have been over long ago—it would not, indeed, have been entered upon; and since all that is really a man's own is his intention (the event being beyond his control), the Bishop of Durham as well deserved the praise of all wise and good men many weeks ago as he does to-day. However, without insisting overmuch upon this part of the question, we will admit that, thanks to the good offices of the Bishop of Durham, the miners' strike is at an end; the men having professed their willingness to go back to work on the reduction proposed by their employers n the early sp ring. It is true that they would have done as much some week or so ago; but then the employers declared that so much injury had been inflicted upon trade by the strike, that they could not resume working except at a further reduction of 3½ per cent. in the rate of wages. Upon this declaration, the strike seemed to make a fresh start; and it has only now been terminated upon the withdrawal of the masters' later demands.

Thus peace has been purchased, as is generally the case, by a compromise; and now the only question concerning the miners' strike that is worth discussing is whether something cannot be done to prevent anything like a recurrence of such a terrible disaster. The men have lost—of that there is no manner of doubt. How much they have lost, it would be impossible to say. The strike has been marked by such manifestations of bitterness of spirit upon the part of the men as to render it memorable as an example of industrial warfare. There was no little violence; but this was quelled by the civil powers. Even more significant than their violence, moreover, was the doggedness with which the strikers prevented not merely draining operations and other services which could be described as directed to safeguard the coal owners' interest, but even such public works as the maintenance of water supply, the raising of fuel for soup kitchens, and so forth. To all intents and purposes, it was private war which the malcontent miners were carrying on—war, with all its miserable consequences for the vanquished; with all its waste and cruelty. And the losers have to live on the battle-field! This is the saddest aspect of the whole wretched business. Whatever may be the loss they have inflicted on their conquerors, the heaviest suffering must still be theirs. If mines have been flooded and royalties and dividends placed beyond the owners' reach, the wages fund of the future has also been sapped. According to report "the stoppage has "proved so disastrous to the mines, that it is estimated "that over 20,000 miners will not be able to find employ-"ment for the next twelve months." Great is the spirit of Trade Unionism; but is not there something in this record to convince its most bigoted worshippers that industrial wars are a bad means of settling industrial disputes? It is not so long ago even in this country that rival barons (and on the Continent, rival towns) knew no better way for the settlement of their differences than an appeal to arms. Like our Trade Unions of to-day, they scouted the suggestion of mediation, whether from priest or layman, while they thought in their pride that they had within themselves the power to humble their adversaries and gain their own terms. It often happened then, as now, that after spending all their substance in the vain attempt to gain their point by force of arms, one or other belligerent admitted the mediation which they once despised.

We sometimes flatter ourselves that, in this blessed nineteenth century of halfpenny newspapers and other triumphs of civilization, we have outgrown all the follies of our coarse, rough, ignorant, skull-cracking ancestors; but have we? Are the striking miners or the locking-out pit-owners such a wonderful advance upon the hot-headed barons and swashbucklers of whose unamiable ways Scott tells us such exciting stories? Alas! ancient error changes its manifestations from age to age; but there is still almost as much of it as ever. We wish it were possible to believe that the recent mediation of the Bishop of Durham between the miners and coal-owners owed its success to something else besides the exhaustion of at least one of the parties. Still more ardently is it to be wished that some means could be devised for rendering strikes as obsolete as duelling, by the acceptance of some rational means of preventing disputes about rates of wages, and composing other difficulties of the industrial community as they arise. Unhappily, we cannot be said to be within measurable distance of any such consummation.

"The More Things Change, the More they Remain the Same."

While we, in England, as already observed, are slowly and laboriously working over again the problems of our ancestors, and learning that if these old people were not altogether so foolish as modern Board School enlightenment would have us believe, we are not yet in a position to call them names, some odd news comes to hand (through an American newspaper) which goes to cheer us up, by showing us that there is at least one respect in which our transatlantic cousins are a generation or so behind ourselves. We allude, in these scarcely complimentary terms, to the report just to hand with reference to the "unique and "interesting fight" that has been in progress in a locality bearing the romantic name of Celina, Ohio, between two rival Gas Companies. Not content with trying to ruin each other by selling gas at ridiculously unremunerative prices, the two undertakings have divided public feeling between their claims to such a depth that the town is actually in a state of uncivil war. "The citizens and "business men, nearly all of whom are interested in one "Company or the other, are arrayed in deadly strife "against each other; and fights and quarrels among "old neighbours and friends are of daily occurrence." Landlords endeavour to compel their tenants to patronize the Company in which they are interested; and on refusal they turn out the recalcitrant occupier. Business men boycott each other; and even the commercial travellers are told the hotels they must stop at if they wish to do business with particular merchants. "In fact, the "town is in a demoralized state; and there is no telling "where the war will end." This is quite romantic. Time was when, under an effete form of government, a harmless citizen taking a walk abroad might be stopped with the inquiry "Under which king, Bezonian? Speak, or "die." And the family feuds of the Guelphs and the Ghibellines are matter of history, as well as of romance. Our friends across the water have changed the occasion, if not the nature, of their internecine quarrels. In Celina,

Ohio, they do not fight about a king; but only about a gas-meter. Who shall deny after this that the world does really move, and that as the poet sings—"The thoughts "of men are widened with the process of the suns."

The Unearned Increment Again.

In a recent number of the Journal, we had something to say upon the vexed question of the "unearned increment," and the various attempts that are being made at the present time to capture this value for the benefit of the community. There is a good deal of incertitude in the public mind as to how problems of this kind should be treated. High-and-dry political economists pretend that the mere discussion of such topics is a sort of treason to the memories of Bentham and Mill and the rest of the kings of the ruling dynasty in economics. But, unless we greatly mistake it, the prevailing temper of mankind in this present age is to resist the presumption that wisdom died with Cobden and his disciples. Thus we ascribe the unquestionable influence of Mr. Joseph Chamberlain upon the men of his epoch partly to the fact that he is not afraid of recognizing the insufficiency of academic political economy, in face of some of the gravest consequences of the growth of wealth, to suggest remedies for evils which everybody deplores. What is to be done with the increase of values due to the great stability of modern government in this country, and to the concentration of populations in certain favoured spots? Is there any possibility of making these benefits public instead of private? Must individual ownership for ever intercept revenues which arise in general exigencies? People will not rest content with the assurance that the pocketing of the "unearned increment" cannot be helped; and it is because Mr. Chamberlain joins so heartily in the modern demand for something to be done to distribute the wealth of the nation more equally among the contributories to it, that he is in such a conspicuous degree a man of the time. Of course, Mr. Chamberlain does not expect to attain the impossible. He sees the growth of the "unearned incre- "ment" clearly enough; but between seeing and grasping it, there is a wide and at present an apparently impassible gulf. How difficult these problems of intercepting the "un- "earned increment" are, was made apparent in the course of the recent proceedings in the House of Commons respecting the Agricultural Holdings Bill. The question was this: Supposing a holding acquired under the powers given by the new law, for purely agricultural purposes, to eventually attain on other accounts an altogether superior value in the land market, to whom should this additional value belong—to the original seller under the Act, to the holder, to the local authority, or to whom? Now here we have the question of the interest in the unearned increment in its very simplest form. But what was the result of the debate? It was found impossible to get away from the plain equity of the rule that when a man buys land, or anything else, he must take his chance of its improving or depreciating in value. If the community are to inherit the "unearned increment," they must also take to the "undeserved decrement." Any tampering by Act of Parliament with conditions of sale, is attended with infinite consequences, reaching backwards through the seller as well as forwards through the buyer. And as it is with land, so it is with such a commodity as gas shares. It is easy to point to the present value of paying gas stocks (which were cheap enough at one time), and to orate respecting the iniquity of making the public pay still for the good luck or the foresight of the investors who in bygone days put their money into gas and kept it there. But when men bought this gas stock, they did so with the knowledge that they would have to stand all the consequences. It is at least an interesting question whether the capture of any possible unearned increment would turn out in the long run to be worth the expense in the shape of the sacrifice of the investors' expectations. If the speculator is to be deprived of his hope and left with his risk, what would become of speculation?

The Opening of the Vyrnwy Water-Works.—H.R.H. the Duke of Connaught has consented to take part in the inauguration of the Vyrnwy Water-Works at Liverpool. The ceremony will take place at an early date; and the Mayor is exerting himself to make the occasion an enjoyable one to as great a number of the citizens as possible.

WATER AND SANITARY AFFAIRS.

The Royal Commission on the Metropolitan Water Supply having last week completed the preliminary investigation of the statements of the Water Companies, now stands adjourned to Monday next, by which day the Commissioners hope to find the County Council ready with their evidence. At the sitting of the Commission last Wednesday, it was apparent that the County Council were by no means desirous of coming forward quite so early. For some reason or other, they were not ready to present their case, though the Commissioners only asked for evidence on one branch of the inquiry; the geological and some other expert evidence being left to a later period. It was perhaps a candid confession on the part of Mr. Cripps, that the Council were possibly less informed on the specific matters which the Commission had to inquire into, than many other parties to the inquiry. So Mr. Cripps suggested that the Commission might take the case of Hertfordshire next in order. But Lord Balfour of Burleigh, the President, remarked that the Commission had now been going on for two months and a half, and during that time the Council should have been preparing to submit evidence. Still Mr. Cripps fought for a postponement; and he proposed July 1 for the production of evidence from the Council. But the President was not to be baffled by such tactics, and signified that the Council ought to be ready at the next sitting. The unreadiness was doubtless a matter of policy. Yet at the same time we can quite understand that the Council are not altogether ready with their facts, although they have spent money enough in their water inquiries to be prepared with something like a preliminary case. If their case is a strong one, why are they hanging back? The Companies have been placed under the disadvantage of taking the initiative, and have been complimented by the Commission for their readiness and willingness in supplying information. What they have said will be the subject of attack; but they will be heard again by-and-bye, in the same branch of the inquiry, so far as they are prepared to refute the statements of their opponents. That the Companies have done well in their evidence down to the present time cannot be disputed, although some of their witnesses have been sharply questioned. But according to the plan laid down by the Commissioners, we are at present only in the first branch of the inquiry; and an entirely fresh array of evidence will be brought forward later on. So far, the points mainly dealt with have been those which relate to the ordinary statistics of the supply, coupled with the estimates of the Companies for the future. The second branch of the inquiry will be more distinctly of a scientific nature, including geological evidence as to the character of the Thames and Lea watersheds. The President has expressed the desire of the Commission not to waste a single day, or hour, in hearing unnecessary evidence; and for this reason it is required that all the statements shall first of all be submitted in documentary form, so that the Commissioners may see whether the evidence is worth having. We shall be curious to see how the County Council fare under this rule. An argument used by Mr. Hollams before the Commissioners was somewhat striking. He referred to the fact that the Royal Commission was instigated by the County Council. It was therefore in the order of things for the Council to come forward and show cause for this Commission. Some kind of accusation was naturally supposed to be in the background, in support of which the Council would produce evidence. But where was the evidence? The Companies had to defend themselves against an unknown indictment. It seems that the County Council would like to hold their indictment back still longer; but the President of the Commission is rightly intolerant of such delay.

The idea that the Metropolitan Water Companies are expending money on works, in order to increase the amount of their claim when a transfer takes place, is certainly not true in respect to the West Middlesex Company, whose Chairman (Sir. W. H. Wyatt) stated before the Commission that his Company would like to have a little more subsiding reservoir capacity, and would have had it long ago, but "they were waiting to see what the turn of events "would be, before laying out money." It is quite likely that a similar feeling actuates other Companies; and assuredly the present aspect of affairs is not calculated to encourage the immediate construction of permanent works.

If there is a prospect of long delay before any change takes place, urgent works must needs be executed. Sir W. H. Wyatt expressed a hope that "the results of this Com- "mission would afford them some light." When the results appear, no doubt they will make the situation clearer than it is at present. We should be glad if some of the remarks made by the President were a little different in their tone. In examining Mr. W. C. Young, the Consulting Chemist to the Lea Conservancy Board, the President asked, "What do you say with regard to the "water at the East London intake as being fit for con- "version into a fluid suitable for consumption." This reads like a question put by an opposing Counsel. The witness was able to make a splendid reply, showing that in April last the Lea water contained less than four-tenths of a grain per gallon of organic matter. "Was that after filtration, as "supplied?" asked the President. "No," responded Mr. Young, "it was just after it was drawn in at the intake." The President must have been somewhat enlightened. That the head of the Commission is perfectly open to conviction, we feel assured; and if his Lordship sometimes appears to handle the Companies a little roughly—as when he told Mr. Fraser, the Engineer of the Grand Junction Company, that "he was sorry not to be able to agree with "him" concerning the depleting of the Thames—there will be the greater confidence on the part of the public in the conclusions arrived at by the investigating body.

Masonic.—Referring to the paragraph in the JOURNAL for May 24, as to the proposed "Emergency" meeting of the Evening Star Lodge, it has been arranged for it to be held on Monday, the 13th inst., at the Freemason's Hall, London, at 5 o'clock prompt. After the ceremony of initiation has been performed by the W.M. (W. Bro. Valon), the members of the lodge and visitors, will dine together at the Holborn Restaurant, at a charge of 5s. each, exclusive of wine. It is particularly requested that tickets be taken *as soon as possible*, in order that proper arrangements may be made for the comfort of the visitors. All, therefore, who desire to attend the dinner, should send a postal order for 5s. to W. Bro. Magnus Ohren, Lower Sydenham, S.E., who will return a dinner ticket by next post. No tickets can be issued after the 11th inst., as the room has to be engaged after the number to dine is known.

Rejection of the Swinton and Pendlebury Gas Bill.—This Bill, as amended by the House of Lords Committee (see *ante*, p. 623), came before the Police and Sanitary Regulations Committee of the House of Commons, presided over by Mr. H. T. Hinckes, last Friday week. Consideration of its details was continued on Monday; and on Tuesday, the Chairman intimated that it was the opinion of the Committee that effect must be given to the agreement entered into with the Corporation, and therefore they had come to the conclusion that the preamble was not proved. It was pointed out by Mr. Bidder (for the promoters) that the Committee had given a decision against him, after hearing evidence in opposition to the Bill, without affording him an opportunity of replying; and this was against the rules and practice of the House. The Chairman explained that the decision referred to the agreement, to which Mr. Bidder rejoined that that was only one part of the Bill, and he should respectfully retire. The Bill was therefore rejected; the view of the Committee being that the agreement did not compel the Salford Corporation to sell a portion of their undertaking in those districts, but only to part with the whole of the pipes, &c., in the districts in question.

Laying of a New High-Pressure Trunk Main by The Gaslight and Coke Company.—The great increase of the population of the Northern suburbs of London during the last few years, has rendered it incumbent upon The Gaslight and Coke Company to watch very narrowly the drain occurring every successive winter on their mains for supplying the large region in question which has to take its gas from a considerable distance. During the foggy week which ushered in last Christmastide, the pressures in this neighbourhood fell to a point which indicated that it would be necessary, before another winter, to reinforce the supply; and consequently, under the direction of Mr. G. F. L. Foulger, the Company's Distributing Engineer, a new 36-inch high-pressure trunk main, two miles long, has been laid this spring from a point in London Fields, where it is connected with the high-pressure main from Bow Common, to a valve-house now in construction at a point chosen with respect to the needs of the North-eastern district, where a pair of Parkinson's double cone governors will reduce the high-pressure gas to that at which it can be discharged into the local distributing mains. At a point near Dalston Junction, where the new trunk main crosses the North London Railway, the crossing is made by means of a steel-plate butt-riveted girder pipe, spanning the distance between the bridge abutments. It is carried outside the parapet, the change of alignment from and into the roadway being effected by special castings. This work is now being done by the contractors of the Company for main laying, Messrs Aird, Lucas, and Ellis.

ESSAYS, COMMENTARIES, AND REVIEWS.

GAS AND WATER COMPANIES IN THE STOCK MARKET.

(For Stock and Share List, see p. 1081.)

THE week just concluded has been only a mutilated one so far as Stock Exchange business is concerned. In addition to being the Derby week, it also contained a Jewish festival; and with the Whitsuntide recess imminent, it was subject to much interruption in the way of business. Speculative transactions were thus kept down to very small proportions; and the tendency generally was dull. There was a good demand, however, for the high-class securities in the earlier part of the week, and prices consequently ruled better; but as business gradually slackened, and with some disposition later on to realize, the best figures were not maintained. In regard to the Money Market, there is nothing fresh to note; the position remaining unchanged. The Gas Market has been quiet; and changes in quotation are few and slight. The principal feature is the continuous rise in the secured issues, in response to the demand for investments for money. Gaslight "A" is very steady. It opened at 209½, and afterwards never went below 208 or above 210—the final deal being marked at the middle price, 209. The debenture, secured, and limited issues were very buoyant; and nearly all of the preferred stocks have made moderate advances. There was a good deal more doing in South Metropolitans than there has been of late; and they had to encounter some degree of hostility. In the result, the "C" was put down 2½; and the "B," 1. But the "A" was left standing, although a bargain was marked at a low figure. Hardly anything was done in Commercials; and they showed no disposition to move. In Suburban and Provincial undertakings, there was scarcely a transaction; and everything remained stationary. The Bromley Company are inviting tenders for 400 new £10 shares at a minimum price of £15 2s. 6d., which is not too much to ask if they see their way to maintaining the old rate of dividend. Flatness was the feature in Continentals, as exemplified by Imperial, which fell 3; but nothing at all was apparent among the rest. In South Americans, Buenos Ayres continues to see-saw—going up one week and down the next. Monte Video have declared their reduced dividend at the rate of 5 per cent. The rest offer nothing to note. The Water Companies still continue to improve in value; the debenture stocks being especially in demand.

The daily operations were: Gas generally was quiet on Monday, nothing being touched but Metropolitan issues. South Metropolitan "C" fell 2½. Grand Junction Water rose 1. On Tuesday, business was almost at a standstill, except for a few dealings in South Metropolitan; the "B" fell 1. Gaslight "F" rose 2. There was a little more activity on Wednesday; but the only movement in price was a rise of 1½ in Gaslight "K." Business continued at a very low ebb on Thursday. Imperial Continental receded 2; and Buenos Ayres, ½. Friday was a little more animated comparatively, but transactions were still much restricted. Gaslight 10 per cent. preferences rose 2; and ditto "K," 1. But Imperial Continental fell 1. In Water, East London debentures rose 2; and Lambeth ditto, 1. Saturday was no busier than usual; and all quotations remained unchanged.

ELECTRIC LIGHTING MEMORANDA.

The Nomenclature of Units of Measurement—The St. Pancras Experiment—Proposed Electric Lighting for York.

WHETHER the new term "kelvin" is or is not destined "to catch on," and so come into habitual use among electricians and the public as a convenient designation for the Board of Trade unit, is a question which we do not pretend to be able to answer offhand. Up to the present time, the electrical and engineering journals have not taken kindly to the word; and many prominent electricians have professed themselves heartily ashamed of the craze for naming units of electrical measurement after more or less eminent gentlemen of their own calling, living or dead. Our useful contemporary *Industries* declares that "electricians are a little apt to make themselves ridiculous in the eyes of others by calling things after members of their own profession. Imagine the Gas Acts being altered, so that instead of '1000 cubic feet' the householder would be charged so much per Livesey." We cannot imagine anything so utterly fantastic; and should not care to suggest such a false compliment to the gentleman chosen by our contemporary to represent the gas industry as Lord Kelvin does that of electrical supply. We have often complained of the cumbrousness of the denomination of the commercial unit used in the sale of gas, and have desired, for convenience' sake, that some convention could be devised that should spare writers and speakers about coal gas the trouble of always mentioning three words to signify what is really meant to be a unit expression. The attempt has been made more than once to get the word "mil," or "mille," sometimes printed with a capital M, adopted for this purpose; but without success. Some American newspapers try to save type by always printing it 1000′. But this is confusion; for the tick already means something else, and nothing is gained by omitting the word "cubic," which is an essential part of the term. In truth, it is no easy matter to find acceptable names for units of

measurement. People will not always use a single word when offered for the purpose in preference to two or three words which convey the idea better. Thus, even in the case of the metric system —which is nothing if not concise and labour-saving—the French themselves, with all their fine sense of logical symmetry, have never taken to the word *stère*, but always use the two words cubic metre. Nomenclature is in truth a puzzle, like man himself, who, being full of contradictions, will never speak a logically symmetrical language.

A strenuous attempt is being made by the St. Pancras Vestry to reduce the idle time which, in the ordinary way, would absorb the prospective profit upon the night working of their electric lighting plant. In the hope of somewhat equalizing the load upon their generating machinery, they have decided to offer a day supply of electricity for power purposes at the "perfectly ruinous price," as a speculative draper would put it, of 3d. per unit, or just one-half of the charge for the night service. The efficacy of a cheap day supply in equalizing the consumption of gas has often been debated by gas managers; but here they will be able to watch a crucial experiment on the same lines in respect of a kind of undertaking which suffers more from inequality of loading than any gas-works. It has to be seen whether trade will be attracted by this risky policy of the St. Pancras Vestry. The electro-motor is practically unknown in this country, because it compares so unfavourably with the gas-engine; and we are doubtful whethe rthe St. Pancras Vestry will be able to make it popular in their electric lighting district. The attempt will, however, be interesting to watch in any event. Of course, a great parade has been made of the "success" that has actually been achieved by the St. Pancras experiment; but so far as we can see, the word only means that Professor Robinson's plans have been carried out to the satisfaction of the Vestry, which, seeing that they closely follow the St. James's Company's arrangements is nothing very wonderful. We shall hardly learn all the truth about the commercial side of this venture for some years; because, as Mr. Garcke told the Bradford people the other day, local authorities never confess a loss if they can help it, and they have many resources for covering up a leak. If electric lighting can be made to pay in St. Pancras, it ought to pay almost anywhere.

The usual fuss is being made locally over a proposal to introduce electric lighting into the City of York; and there is every probability that the money of the ratepayers will be squandered here, as in other places, in order to find work for touting electricians. There must be quite a settled plan of campaign for the guidance of the electricians who work this class of business. At any rate, there is a remarkable likeness between the manœuvres which in different parts of the country lead up to a municipal electric lighting "experiment." Not to put too fine a point upon it, the most effective weapons in the hands of the electricians who lay siege to our provincial municipalities are usually lies, evasions, and misrepresentations. We do not say, of course, that men like Mr. Crompton, who has advised the York Corporation, are to be put in the same category with the Brush and House-to-House emissaries, who care little what they say so long as they can snap up a contract here and there; but even Mr. Crompton, when he is put to it, prefers, for obvious reasons, to talk of Bradford, and of the Westminster and Pall Mall Companies, rather than to dwell upon the experience of the Massingham speculations. And there is in most towns some rabid town councillor who is ready to urge, in season and out of season, that in the sacred name of Progress his native place must plunge headlong into the first plausible electric lighting scheme that comes recommended by learned professor or respectable engineer. These things must be; but it is not our fault if readers of the JOURNAL in these threatened localities fail of their duty and neglect to keep their fellow-citizens alive to the existence of that "other side of the shield" which is regularly exhibited in these pages for the benefit of all whom it may concern. So far as York is concerned, it must be acknowledged that in the York Gas Company, the electricians and their friends in the town council have as powerful a rival to meet as they could find anywhere in the Kingdom.

A Large Steel Water-Pipe.—The works for conveying the water from La Vigne and Verneuil to Paris are now in process of construction. They consist, first, of an aqueduct which brings the water from the department of Eure-et-Loire, to St. Cloud; secondly, of a reservoir at the latter place; thirdly, of a conduit for bringing the water from St. Cloud to Paris. The conduit itself is of mild rolled steel, 5 feet in diameter inside; the thickness calculated so that the stress does not exceed 3·8 tons per square inch. It has been made slightly thicker in order to allow for oxidation. The maximum thickness will, however, be 0·235 inch. According to the conditions imposed in the specification, the rivets, which are also of mild steel, may stand out on the inside if the heads are round. The tubes may be lap-jointed; but the inside diameter must be 5 feet. The supports, which are of cast-iron, are to be close enough together to prevent any sag of the tube under the pressure of water. The elbows are to be of cast iron, and the cramps of wrought iron. Two discharge-tube 15·6 in. in diameter, will be arranged at the lowest points of the conduit, closed with sluice-valves; while the air-valves are at the highest points.

THE WATER COMPANIES (REGULATION OF POWERS) BILL AND LOCAL AUTHORITIES.

We print on another page the proceedings which took place in the House of Lords on the report stage of this Bill, when the Earl of Wemyss moved an amendment to extend its provisions to Corporations and other Local Authorities supplying water. We called attention in the JOURNAL for the 24th ult. to the one-sided character of the Blll, which purports to be for the protection of water consumers, and yet only includes those supplied by Water Companies. Lord Wemyss characterized the Bill "as illogical, inconsistent, and one-sided;" and the House agreed with his views of it. But Lord Henniker, speaking on behalf of the Local Government Board, suggested that the Bill should be allowed to pass in its present form, and that a Bill should be introduced next session providing for the extension indicated by Lord Wemyss. His Lordship, having stated that he was satisfied with the strong expression of opinion made by the House in favour of the principle of his amendment, then withdrew it.

The Bill has now passed the House of Lords, and is down for second reading in the House of Commons for Tuesday next; and although, in view of the coming dissolution, it is not likely to pass this session, no efforts should be spared on the part of Water Companies and Local Authorities supplying water, to secure the defeat of a measure, the effect of which, if it became law, would be to promote endless litigation and disputes, and entail enormous trouble and expense on the Companies, with no compensating advantage to any honest consumer. We have said that Local Authorities are interested in the Bill; and this undoubtedly is the fact, although its provisions do not directly apply to them. But from the proceedings in the House of Lords to which we have just referred, it is evident that, if the present Bill passes, a Bill to extend its provisions to Local Authorities will be introduced next session. Such a Bill would probably consist of one clause; and it is unlikely that any amendments would be made in it. The argument against doing so would be that an Act already existed protecting every consumer supplied by a Company, and that he was entitled to have the same protection if supplied by a Corporation.

We think, under the present circumstances, that the Bill, being admittedly incomplete, ought to be at once withdrawn; but if this is not done, it behoves all local authorities supplying water to use their utmost endeavours to defeat it, so as to enable them to have an opportunity of considering a complete Bill in all its details, if one should be introduced in a future session. By doing so, they avoid being drawn under the provisions of the present Bill, in the manner suggested by Lord Henniker.

FRENCH RULES FOR LIGHTING.

It was stated, in the course of the notice of the work of Dr. Palaz, upon Industrial Photometry, which we gave last week, that this book contains a scholarly chapter upon "Lighting." It would hardly be respectful to the author or to the subject to dismiss this portion of Dr. Palaz's work with a single remark; and so we propose to separate the author's treatise upon the "Distribution and Measurement of Lighting" from the rest of his writings, for the purpose of giving our English readers a succinct epitome thereof, which may without much risk of error be regarded as the latest expression of French science in this regard.

Dr. Palaz remarks that, in order to determine the value of any system of lighting, it has long been deemed sufficient to multiply the number of centres of light by their luminous intensity, and then to divide the gross total of luminous units by the illuminated area. It is hardly necessary to point out that this method is only capable of giving very imperfect results; because different kinds of lights send out their rays differently. Thus, it is inadmissible to compare in this way gas with electric lighting, whether by arc or incandescence. The intensity of the luminous radiations varies so with their direction, that the effects of two different gas-lamps cannot be fairly compared by this method, much less those of gas with an electric arc lamp. From the practical point of view, says Dr. Palaz, what we want of any system of lighting is that the illuminated surface shall receive over its whole extent a minimum quantity of light per unit of area—that is to say, that its illumination shall not fall below a certain given limit. In order to compare the values of two systems of lighting, it is therefore necessary to consider the character of the lighting produced by each and study the variations; the system which gives the highest average lighting with the least variation being adjudged the better.

The photometrical elements of a luminous source being known, it is possible to theoretically deduce the value of the lighting afforded at any point of a given surface exposed to this light, provided that the position and height of the source are also known. It may even be calculated what distribution of such sources will produce the most favourable result. However, the problem is not really so simple as it appears to be; because it is necessary in practice to take account, not only of the more or less regular variations of luminous intensity according to the direction of the rays, but also the phenomena of

absorption and reflection of light. The influence of reflection is almost insensible in the lighting of a large plane surface; while it plays an important part in the lighting of interiors and enclosed areas. The absorption of light by the medium through which it passes, only operates practically in the case of public street lighting. It may therefore be neglected; because this phenomenon (of absorption) only attains sensible proportions in foggy atmospheres, which must be regarded as exceptional conditions not to be taken into account in settling the data of lighting for ordinary circumstances. Calculations relating to the distribution of lighting over a surface are simple when single light sources, supposed to radiate equally in all directions, are alone in question; but when it is a general problem relating to the lighting effect of many sources, whose illuminating power varies according to the direction of the ray, the study of the distribution of light becomes very complicated.

The quantity of light dq received by an element of surface ds, of which the normal makes an angle i with the direction of the luminous ray, is proportional to the cosine of the angle, and inversely proportional to the distance d from the source. Whence we have the ratio $dq = \frac{I\,ds\cos i}{d^2}$. We call the *intensity of lighting* of a given point of the surface the quotient of the quantity of light dq received by the element ds of this surface, by the superficies of this element ds. Therefore $e = \frac{dq}{ds} = \frac{I.\cos i}{d^2}$

Considering ds as unity ($ds = 1$), we may also call the intensity of lighting the quantity of light received by a unit of surface.

The distinction between the expressions *intensity of lighting* and *lighting*, introduced by M. Wybauw, is very useful, for it enables us to speak of the intensity of lighting in a given point whilst only considering the lighting of a surface. The intensity of lighting is a mathematically defined quantity, $e = \frac{dq}{ds}$; while lighting is a physical, or even a physiological notion. It is necessary to define the unit adopted to express the intensity of lighting. It is a unit ($e = 1$) made up by taking the intensity of lighting produced under the normal incidence ($i = 90°$) by the unit of luminous intensity ($I = 1$) placed at the distance 1 ($d = 1$). Thus, the unit of the intensity of lighting is brought to the unit of luminous intensity. If the latter is the carcel, and metric measurements are followed, the unit of the intensity of lighting will consequently be the *carcel-metre*. If the standard is the candle, and the measurements stated after the English fashion, then the unit will be the *candle-foot*. M. Hospitalier has proposed to express the intensity of lighting in candles per square metre, and not in candle-metres, because the intensity of lighting is inversely proportional to the square of the distance, which does not appear from the expression; but Dr. Palaz does not regard this criticism as being well founded.

Dr. Palaz thus gives the fundamental rule for determining the lighting of a horizontal plane: Let I be the luminous intensity of any source of light, placed at a height h above the horizontal plane which is to be lighted. The intensity e of the lighting at any point P in this plane, situated at a distance x from the foot of the lamp-post, is to be found by the formula $e = \frac{I \sin a}{h^2 + x^2}$, where a is the angle formed with the horizontal by the ray joining the source of light and the point P. Simple transformations permit us to give to this formula any of the following shapes:

(2) $e = \frac{I \cos^2 a \sin a}{x^2}$; (3) $\frac{I \sin^3 a}{h^2}$; and (4) $e = \frac{I h}{(h^2 + x^2)^{\frac{3}{2}}}$.

From inspection of which formulæ some very interesting conclusions are to be drawn.

For example, the third formula shows, among other things, that the variation of lighting in the horizontal plane—the light-source being at a constant height—is proportional to $\sin^3 a$. This lighting is therefore at its maximum at the foot of the lamp-post—that is to say, for $a = 90°$. By the aid of the second formula, we easily ascertain the height at which the light source should be placed in order to obtain the maximum intensity of lighting at the distance x. It suffices for this purpose to make the derivative of the second member of the formula equal to zero. This gives the equation $\frac{I \cos a}{x^2}$. $(\cos^2 a - 2 \sin^2 a) = 0$; which works out to $\tan a = \sqrt{\frac{1}{2}}$. The angle a therefore corresponds to 35° 16′; the corresponding height h is given by the formula $h = x \tan a = \frac{x}{\sqrt{2}} = 0{\cdot}707x$. In words, to obtain the maximum intensity of lighting at a point of the horizontal plane situated at the distance x from the feet of the lamp-post, the latter must be fixed at a height equal to $0{\cdot}707x$. The fourth formula allows of the solution of an analogous problem—to compute the radius x of a circumference which receives lighting of a given intensity e, the height of the lamp-post being stated. Here $x^2 = \left(\frac{I\,h}{e}\right)^{\frac{2}{3}} - h^2$. Or we may suppose h to be variable, and calculate the greatest value of the radius x corresponding to a stated intensity of lighting e. It suffices for this to make zero the derived value of x, obtained by the help of the third equation. We shall then have for a the condition $\sin^2 a = \frac{1}{3}$; $\cos^2 a = \frac{2}{3}$; or $\tan a = \frac{1}{\sqrt{2}}$. This angle is the same as that in the former problem. It is therefore equal to 35° 16′, and corresponds to $h = \frac{x}{\sqrt{2}}$. The distance x thus becomes, by substituting for $\sin a$ and $\cos a$ their proper values, $x^2 = \frac{2}{3\sqrt{3}} \frac{I}{e} = 0{\cdot}385 \frac{I}{e}$.

Dr. Palaz next proceeds to open up a discussion of the subject of the mean lighting of a surface; but since this is no more than a mathematical expression, it is not necessary to reproduce what he says about it. He also debates the question whether, in calculating the effect produced by a source of light, the determination should be made with reference to a horizontal plane or a plane normal to the luminous rays. Some specialists take one view, others the contrary; among the latter being Mr. Wybauw, who claims that it is in effect the lighting of the normal plane which plays the principal part in the actual distribution of light. Mr. Wybauw argues that "It is not generally the geometrical horizontal plane properly so called that has to be lighted, but the objects which are found upon this plane. Upon the public thoroughfares, these are the wayfarers, the carriages, the prominences and holes of the pavement; and it may be said in general that the bodies which must be lighted most commonly present faces and forms differing from the horizontal plane. Thus, there is no reason why we should consider the lighting of a horizontal plane more than any other." This argument Dr. Palaz dismisses, very justly as we think, upon the objection that the horizontal plane of the road surface is after all the principal feature of it, and regulates the apparent positions of everything upon it. If lighting is to be judged by a fresh standard—that of *useful effect*—it is possible to show, both by calculation and by observation, that any particular example of street lighting is really better than computation after the rule of the cosine makes it appear. Not only do prominences, sharp edges, passengers, vehicles, &c., actually receive more light from a distant source than the horizontal surface from which they stand out, and therefore exhibit themselves in greater relief as compared with the latter; but the rule of the cosine (which gives the intensity of lighting as the quotient of the illuminating power of the light source, multiplied by its height and divided by the cube of the slant distance) takes no account of a variety of considerations which exercise an important influence upon the apparent lighting. Among these, is the reflecting power of the surface itself. Any horizontal plane appears more highly lit as its reflecting power is increased. A plate painted black appears less illuminated than a white one receiving the same amount of light; and objects detach themselves less clearly from the first than from the second. It has been usually admitted that the law of photometrical emission was rigorous, or at least as exact as possible; but some recent researches by Herr Seeliger, of Munich, have proved that the greater part of the substances employed in building construction do not follow, even at a great distance, the theoretical rule. Divergencies of 20 per cent. have often been found, with inclinations of from 20 to 25 degrees. It follows that "calculations of lighting based upon the law of the cosinus cannot give rigorously exact results; we must be contented with results more or less approximate."

It consequently becomes reasonable to take account in lighting problems of two methods—that of lighting properly so called, and that of the useful effect of the light. Dr. Palaz concludes that the intensity of lighting, as deduced from the fundamental laws of photometry, represents the inferior limit of the lighting obtainable in any case; while the useful effect, as defined by M. Wybauw, would be the superior limit of the same quantity. Dr. Palaz shows how the so-called Wybauw effect is to be computed; but we shall not repeat the demonstration here, being convinced that it possesses no appreciable practical value.

(To be Continued.)

The Projected Gas-Works Extensions at Belfast.—Mr. Corbet Woodall and Mr. W. Foulis have recently visited Belfast for the purpose of examining and reporting upon the various sites which have been proposed for the extension of the gas-works. Their reports will shortly be laid before the Council.

The Austrian Gas Industrial Union.—The twelfth annual meeting of this Society was held in Vienna, on the 27th and 28th ult., under the presidency of Herr C. Bauer, of the Imperial Continental Gas Association. The meeting was attended by about 70 members, who took the opportunity of inspecting the gasholder at the Imperial Continental Gas Association's works at Tabor. This holder—the largest on the Continent—was erected last year by Messrs. S. Cutler and Sons, from designs by Mr. Corbet Woodall. A visit was also paid to the Association's works at Erdberg, where two experimental furnaces with inclined retorts were seen in action. A prize of 100 florins for the best paper read before the meeting was unanimously awarded to Herr F. Bossner, the Central Inspector of the Austrian Gas Company, for an interesting and instructive communication on the new form of the "Welsbach" light, which is now largely in use in Vienna. Herr Bauer was re-elected President; and it was decided to hold the next meeting at Pressburg.

NOTES.

The Separation of Carbonic Oxide from Water Gas.

Another process for separating carbonic oxide from water gas has been invented; the patentee being Mr. Henry S. Blackmore, of Mount Vernon, New York. Mr. Blackmore's process consists in a method of exposing the water gas to the action of a caustic alkali, heated to the point of fusion. For this purpose, he prefers to place his caustic alkali in a cauldron, which is set in a part of the generator where it can be heated by the spent heat of the furnace gases. As the alkali melts, it runs out of the cauldron into the top of a vertical structure like an ordinary water gas superheater, packed with neutral material—the object being, in technical language, to "scrub" the nascent water gas with fluid alkali. Mr. Blackmore avers that in his process the reaction between the gas and the alkali is divided into two stages, the first resulting in the production of a formate of the alkali employed, followed by further action which produces free hydrogen and a carbonate of the alkali. This latter, being still in a fused state, escapes from the gas generator into a trap; whence it is finally washed out by the steam, to be restored to its original causticity by treatment with slaked lime. The alkali used in this process may be potash or soda, or a mixture of the two materials. There is a great likeness between this process and the earlier one of Professor W. Crookes, of which Mr. Blackmore probably never heard.

The Character of Sulphur.

Some little excitement has been caused among chemists by the circulation of a rumour, which is repeated by the *Chemical News*, under all possible reserve, to the effect that the elementary character of sulphur has been called in question. It is stated that Dr. Gross has been for many years engaged in extensive researches upon sulphur; and that certain of his results have been disclosed at a meeting of the Berlin Physical Society. Among other phenomena, it is reported that, after passing a powerful electric current by means of a platinum wire through a mass of barium sulphide fused in a silver crucible, it was observed that the barium had combined with the platinum to form a new compound, while some 50 per cent. of the sulphur had disappeared, leaving a corresponding quantity of a new substance in its place. Dr. Gross therefore considers that sulphur is no element, but is merely the hydride of the new body, whatever it is. The suggestion is a very startling one; and if Dr. Gross's suspicion turns out to be well founded, the discovery may have a variety of practical effects in different quarters. But for the present, it will be as well to reserve any question on the subject until the results of further research have appeared.

The Radiating Effect of Hot Air.

Some interesting experiments to determine the radiating effect of hot air have been made by Mr. C. C. Hutchings, and are described in the *American Journal of Science*. The author caused a stream of hot air to pass in front of one of the faces of a thermopile at a distance of 3 centimetres, causing the deflection of a galvanometer needle. The normal working of the arrangement was secured by placing in its vicinity a large Leslie cube, containing water at the temperature of the laboratory. There was no sort of agreement between measures made on eight different days, to determine the absolute radiating power of a column of air 1 centimetre thick at a temperature near to 100° C. Tyndall's result—which shows that the radiation depends upon the amount of moisture in the air—was confirmed; but no exact relationship between the two factors was found. This was probably because the air contained varying quantities of accidental impurities. The increase of radiation was found to be proportional to the rise of temperature. There was a small increase of radiating power when sheets of air more than 1 centimetre thick were used; but no difference was detected for sheets of less than this thickness. These experiments hardly do more than touch upon the fringe of a highly important subject.

The Best Colour for Artificial Light.

It is a question of great physiological interest, whether artificial light, by the use of which the activity of the human eye is prolonged after sunset, should be of the same colour as sunlight or daylight, or should have a distinct "tone," whereby the nerve-elements of the eye which are strained all day long may be allowed to rest. There is a notorious difference, for instance, between the colour of gas or candle light and that of the electric arc light. The latter is usually called a blue light—sometimes with the addition of the uncomplimentary adjective "ghastly." In daylight, however, the electric arc does not appear to be blue, but rather reddish. Arguing on these premisses, some partisans of electric arc lighting have contended that is only by comparison with the yellow gas and lamp light that the former appears blue; when relieved of this contrast, they claim that the arc light no longer strikes the eye as bluish. Consequently, it is pretended that the right way to redeem the character of the arc light for whiteness is to use it freely, if not exclusively, so that the eye may become habituated to take it for the standard of comparison instead of gas or lamp light. The whole question, it is said, turns upon a point of physiological prejudice. When we are more used to gas or lamp light, then the light of the infrequent arc strikes us as bluish; if the latter preponderates in our experience, then we see the former as dull and yellow. Still, the question remains, which is the best artificial light—something which carries on the physiological effects of daylight, or something which is complementary to it? The query affects not only the competition between the electric arc and other kinds of light, but also that between the Welsbach incandescent and other forms of gas-burner. The problem may be attacked on one side by any reader or writer by gaslight, who will take sufficient trouble to experiment on himself with the naked light and with red or green glasses respectively.

Oil Fuel at Chicago.

Some authoritative figures respecting the comparative values of solid and liquid fuel come out in connection with the tender by the Standard Oil Company, for the contract for the supply of fuel to the Chicago Exhibition. Upon the assumption that three barrels of 42 (United States) gallons of oil are equal in heating power to a ton of coal, the Standard Oil Company sent in tenders to the Exhibition authorities offering to furnish all the fuel needed by them for 1892 and 1893 at 70 and 72½ cents. per barrel for the two years respectively. Various estimates of the quantity of coal required during the two years had been put forward. The lowest was 75,000 tons; so that the Standard Oil Company would have to deliver at Jackson Park at least 225,000 barrels of fuel oil, and in all probability much more. The tenders for coal ranged from $2·44 to $3·95 per ton; as against the Standard Oil Company's oil at $2·10 and $2·175. The bait is tempting; but the Exhibition authorities are reported to be hesitating between the two kinds of fuel. There are more reasons than one why the adoption of oil fuel for the Exhibition should be thoroughly well considered.

COMMUNICATED ARTICLE

COAL GAS: ITS MANUFACTURE, DISTRIBUTION, AND CONSUMPTION.

A Series of Articles for Gas Students.

(*Continued from p.* 704.)

PURIFICATION.

Before proceeding further, it will be well to consider something as to the composition of the crude gas as it issues from the retort. Most students are well aware that this is no simple or elementary gas, nor yet a compound gas of definite composition; but it is a mixture of different gases—each being a more or less complex compound of other substances.

In the crude gas will be found (*vide* Watts)—

- Ethylene or olefiant gas (C_2H_4)—the most valuable.
- Acetylene (C_2H_2).
- Vapours of volatile liquid hydrocarbons.
- Methane or marsh gas (CH_4)—the most abundant.
- Nitrogen.
- Hydrogen.

} Diluents.

Removed, wholly or in part, by purification:

- Carbon monoxide.
- Tar and volatile oils.
- Water.
- Ammonium salts—sulphates, sulphides, and chlorides.
- Ammonium cyanide and thiocyanate.
- Sulphuretted hydrogen (H_2S).
- Carbon dioxide (CO_2).
- Carbon disulphide (CS_2).

The proportions present of the constituents of crude coal gas here enumerated will be found to vary considerably in different works, and at different times in the same works. They will be affected by the changing temperatures employed for carbonization, and by other working conditions. Different coals, too, will necessarily give different results. Thus it is impossible to tabulate these proportions; but the following paragraph, dealing with the subject approximately, is very interesting. It is from the pen of Professor Wanklyn, in his "Gas Engineer's Chemical Manual"—a book that should be in the hands of every gas student:—

> As it leaves the retort in which it is generated, coal gas is very impure. It is accompanied by rather less than one-third its weight of tar, by nearly half its weight of watery vapour, by about 1-50th of its weight of ammonia, by a little more than 1-20th of its weight of carbonic acid, by from 1-50th to 1-20th of its weight of sulphuretted hydrogen, and by from 1-300th to 1-600th of its weight of sulphur in the condition of sulphuret of carbon and organo-sulphur compounds.

The bulk of the heavy tar is deposited in the hydraulic main; and the lighter portions, still retaining the gaseous or vapour form, are condensed down by cooling. Some of the tar is present in the form of minute vesicles or globules, each enclosing its own volume of gas. These tarry vesicles, which impart to the crude gas its dense smoke-like appearance, can be discerned on examination by the aid of a microscope. The method of dealing with them will be referred to later on.

The term "purification," as applied to coal gas, may be held to mean the removal therefrom of not only actually deleterious compounds, such as sulphuretted hydrogen, bisulphide of carbon, carbonic oxide, &c., but also the separation of all substances which are foreign to the purified gas of commerce, such as tar, water, &c.

The Condensers.

Of appliances specially designed to the above end, the condensers are the first with which the gas issuing from the retort

is confronted, unless, indeed, the foul main be included in this connection. Where this main is carried round the retort-house, it is frequently designated the primary condenser, while the condensers proper are termed secondary condensers. The object of the condensers is two-fold—direct and indirect; the latter following as a sequence to the former. In the first place, the temperature of the gas must be reduced sufficiently to allow of the ready elimination of ammonia, carbonic acid gas, and other substances, the extraction of which would be much impeded, or rendered impossible, by heat. Following this reduction of temperature is a deposition of much, but not all, of the tarry matter, which at ordinary temperatures assumes the liquid form (not all, because the presence of some of the richer hydrocarbons assists in retaining, holding in suspension, and actually carrying forward, some of the lighter hydrocarbons, which, if alone, would be deposited). Also a large quantity of aqueous matter which itself has absorbed quantities of ammonia (free, and in combination with sulphur compounds, and carbonic acid, forming soluble salts), carbonic acid, and sulphuretted hydrogen. Thus an important part of the purifying work is done in the condensers.

It is not well, however, to reduce the temperature to below (say) 50° Fahr. as a safe limit, owing to the liability of the gas to deposit the valuable hydrocarbons just referred to, and being proportionally reduced in its illuminating power. Moreover, in the event of the gas being lowered to 40° Fahr., it is doubtful whether the various chemical changes that should be taking place in the calcium or oxide purifiers will not be seriously interfered with, or brought to a standstill altogether. Hence excessive cooling is to be avoided. Bearing in mind the minimum stated, it is the better plan to work so that the heat of the gas on leaving the condensers may be within a few degrees of the atmospheric temperature.

Another consideration is that if the gas be passed through the various purifying appliances, and on through the station meter, at a temperature differing materially from that at which it will be measured in the consumers' meters, the registration of the latter, according to the law of Charles—*i.e.*, the law of the relation of the temperature of gases to their volume—must register differently from the station meter, with resulting discrepancies in the manager's ultimate returns of gas made and gas sold. As intimated in a previous article, the process of cooling must be very slow and gradual; otherwise, similar conditions to those noted as attending excessive condensation—as regards the deposition of hydrocarbons—may be experienced. These are: Loss of illuminating power, and the carrying capacity of gas impaired, with the deposition of those lighter hydrocarbons which should have been taken forward by the richer series—some being deposited in the liquid form in the district syphons, others in a solid form, as naphthalene, in the mains, services, public lamps, meters, and consumers' fittings, giving endless trouble to consumer and producer alike, not to speak of constant stoppages on the works from the same cause.

There are in use many forms of condenser; the cooling agencies employed being air or water, or both. Air is now chiefly used; but the early pioneers of gas lighting had one or two very simple contrivances where water was utilized for the purpose. In some arrangements, the condenser consisted of a serpentine pipe, surrounded by a tank of water. John Malam had a condenser (now often spoken of as "Malam's washer") which answered the further purpose of the scrubber of the present day. It consisted of a cast-iron case, in which were placed a series of horizontal trays, one above the other, not quite the length of the case; the space between the end of tray and the case alternating right and left with each successive tray. Water brought in at the top filled No. 1 tray, which overflowed into No. 2; and this being filled, overflowed into No. 3, next below it, and so on until all were filled down to the bottom tray, whence a suitable outlet for the water was provided. Gas, entering at the bottom, passed over the surface of the water in the bottom tray, through the space referred to, to the next tray above, over the water in this tray, and on to the next, until ultimately it found its way to the outlet at the top; being considerably cooled by the constant contact with water, and having lost much of its ammonia by the same means.

In order to fully observe the necessary precautions relative to gradual condensation, facilities must be provided for graduating the extent of cooling to be accomplished in accordance with the varying requirements of the winter and summer seasons. The use of water as a cooling medium probably offers the most perfect means of thus graduating the temperatures; but it is not always the most convenient or economical agent to employ. Where air is utilized alone, provision should certainly be made for regulating the supply of cooling air to the condensers; also for effectually protecting them from the extremes of summer's heat and winter's cold. There should also be provision for regulating the area of cooling surface to be employed in accordance with the make of gas, which, of course, varies much during the year. If such arrangements are well and carefully made, there is surely no reason why atmospheric condensing should not be adjusted to the greatest nicety. It will be an advantage to provide, on the inlet and outlet of the condensers at least, thermometers suitably made for ascertaining instantaneously the temperatures of the gas.

Of atmospheric condensers there are three principal forms—the annular, the ordinary plain pipe form, and the battery. The cooling of the gas is effected by the radiation from their outer surfaces, of the heat imparted to the pipes by the gas itself.

In preparing the following description of the various types and designs of condensers referred to, much assistance has been derived from a very excellent article dealing with this subject in "King's Treatise on Coal Gas."

The Annular Condenser.

This apparatus consists primarily of a series of upright pipes of large diameter, placed (in the ordinary form) on boxes or troughs for the reception of the condensed tar and liquor; or, as in improved forms to be described later on, on their own foundations—the tar and liquor being carried away direct. Within each of the larger pipes is placed a smaller one open top and bottom to the atmosphere. (When the box referred to is used, this smaller pipe will pass right through it, and is open at the bottom.) The annular space thus formed is closed at the top—and when the box is dispensed with, at the bottom also—by circular ring-plates bolted on to the flanges at the ends of both pipes.

The gas passes along this annular space. Entering at the top of the first condenser, it passes downwards to the lower end, then, by means of a pipe placed diagonally, it finds its way to the top of condenser No. 2, down the annular space there provided, through another diagonal connecting-pipe to No. 3, and so on right through the series—*the flow of the gas through the condensers being thus always in a downward direction.* The smaller inside pipe forms a sort of shaft through which the air, entering at the bottom and absorbing the heat, becomes rarified; and on ascending causes a current or draught, which is considered the great advantage of this type of condenser. While the gas is passing downwards in the annular space, the air is ascending in the pipe within. The reduction of temperature effected is thus intensified by the upward rush of the cold air. This is, of course, quite supplemental to the considerable cooling area provided by the surface of the outside pipe of large diameter. It is usual to provide a circular disc or throttle valve, either secured by a hinge or loose, by which the current of air up the inner pipe can be regulated at will, or shut off altogether if desired. Thus the available duty of this condenser is perhaps more at command than in any other of the atmospheric type.

(To be continued.)

TECHNICAL RECORD.

INSTITUTION OF CIVIL ENGINEERS.

The Annual General Meeting of this Institution was held last Tuesday, when the report of the Council for the session 1891-92 was presented.

It commenced by stating that the objects of the Institution were so widely known, had been so frequently referred to, and appeared to be so largely appreciated, that they might be passed over without comment. The constitution had remained unchanged since December, 1878, when the class of Associates was divided into two groups—one being Civil Engineers, to whom corporate privileges were granted, and who were distinguished by the title "Associate Members;" the other being non-corporate Associates, described as "persons able, from their connection with Science or the Arts, or otherwise, to advance professional knowledge." The Council had carefully guarded the admission of new members to every class; and the qualifications of all candidates had been subjected to rigid scrutiny. It was believed that a strict inquiry into each candidate's career was better than any system of examination. With regard to the changes in the roll of the Institution, it was stated that 59 Associate Members had been transferred to the class of Members, and there had been elected 3 Honorary Members, 28 Members, 324 Associate Members, and 7 Associates, while 4 Associate Members had been restored to the register. These additions together amounted to 366. After deducting 155 names from deaths, resignations, and erasures, there was an increase of 221, bringing up the total number on the register to 5371, as against 5150 at the corresponding date last year. This enumeration was irrespective of the Students; but including them, the total number on the books was now 6239, as against 6064 twelve months ago.

Allusion had been made on several occasions, the report continued, to the fact that, as the Institution included all classes of Civil Engineers, it must be expected that the "Minutes of Proceedings" would be gradually modified and developed, so as to meet the wants of its more diversified membership. Having regard to these considerations, it would be found that in constructive engineering, five papers had been read last session. Two of these—"The Bishop Rock Lighthouses," by Mr. W. T. Douglass, and "The Illumination by Gas of Tory Island Lighthouse," by Mr. D. C. Salmond—referred to sea-coast works of supreme importance to every maritime nation. The three communications on "Portland Cement" and "Portland Cement Concrete," by Messrs. Bamber, Carey, and Smith, related to a material fast becoming indispensable to the constructive engineer. Two papers directly connected with municipal engineering, were submitted for discussion, namely—on "The Sale of Water by Meter in Berlin,"

by Mr. Henry Gill, and on "The Sewage-Farms of Berlin," by Mr. H. Alfred Roechling. Both bore witness to the advanced condition of sanitary matters in the capital of the German Empire. The elaborate paper by Mr. Alex. R. Binnie, "On Mean or Average Annual Rainfall," must also be classed with this branch of engineering, as referring to one of the data upon which the water-works engineer based his calculations. After alluding to the other papers read, the report finally referred to some questions of importance belonging primarily to the domain of physics, and which required to be attentively studied by all engineers; and especially was this the case in respect to the operations connected with the measurement of light and heat, dealt with in the papers by Mr. A. P. Trotter, on "The Distribution and Measurement of Illumination," and Professor W. C. Roberts-Austen, on "The Measurement of High Temperatures."

To the authors of some of the communications, the Council had made the following awards: A "George Stephenson Medal" and a "Telford Premium" to Mr. Alex. R. Binnie; "Telford Medals" and "Telford Premiums" to Mr. A. P. Trotter and Mr. W. T. Douglass; and "Telford Premiums" to Messrs. H. Alfred Roechling, A. H. Curtis, W. Airey, H. Gill, and Professor W. C. Roberts-Austen.

The papers which had been deemed suitable for printing without being discussed included the description of the "Nagpur Water-Works Extensions, by Mr. E. Penny, and of "The Southampton Water-Works," by Mr. W. Matthews; also that by Professor W. C. Unwin, on "The Transmission and Distribution of Power from Central Stations by Compressed Air."

The Howard Quinquennial Prize had been awarded to Sir Isaac Lowthian Bell, Bart., F.R.S., for his treatise on "The Principles Involved in the Manufacture of Iron and Steel."

The report, after discussion, having been adopted, cordial votes of thanks were passed to the President, to the Vice-Presidents, to the Members of Council, to the Auditors, and to the Secretaries and Staff.

The Scrutineers then announced that the following gentlemen had been elected to serve on the Council for the ensuing year: President, Harrison Hayter; Vice-Presidents, Alfred Giles, M.P., Sir Robert Rawlinson, K.C.B., Sir Benjamin Baker, K.C.M.G., LL.D., F.R.S., and Sir Jas. N. Douglass, F.R.S.; Other Members of Council, W. Anderson, D.C.L., F.R.S., J. Wolfe Barry, Alex. R. Binnie, E. A. Cowper, Sir Douglas Fox, J. C. Hawkshaw, M.A., Charles Hawksley, Sir Bradford Leslie, K.C.I.E., George Fosbery Lyster, James Mansergh, Sir Guildford L. Molesworth, K.C.I.E., W. H. Preece, F.R.S., Sir Edward J. Reed, K.C.B., F.R.S., M.P. William Shelford, and Francis W. Webb.

OHIO (U.S.A.) GASLIGHT ASSOCIATION.

The Annual Meeting at Columbus.

(*Continued from p.* 847.)

Mr. J. Faux, of Pittsburgh, Pa., read a paper on "Gas-Burners and the Gas Companies' Interest in them." He commenced by enlarging on the importance of good burners, and the waste of gas and unnecessary vitiation of the atmosphere, with perhaps injury to eyesight, due to defective ones. After describing the flat-flame and the Argand burners, the importance of avoiding excessive pressure at the point of combustion was noticed, and also the precautions to be observed in dealing with different qualities of gas. The author went on to lay down the principle that in each town the suppliers of gas ought to supply burners suited to its combustion, and also to see that they were kept clean. Good burners would not give satisfactory results if allowed to become choked or corroded. The Siemens-Lungren regenerator and the Welsbach incandescent gas-burners were also considered, at some length. A discussion followed, in the course of which there was a general agreement as to the desirability of gas companies turning their attention to this question, by seeing that their customers were supplied with proper burners, and that the same were kept in good order.

A paper on the relation of holder capacity to output was read by Mr. G. N. Clapp, of Middletown, Ohio. After remarking that the stockholders' view of this question was "How small a gasholder can you get along with?" he instanced the disadvantages of working with insufficient storeage; and arrived at the conclusion that the gasholder capacity should be equal to the maximum output per 24 hours. It was followed by a short discussion, in the course of which Mr. Humphreys claimed that, by using a water-gas plant as an auxiliary, a very much less storeage capacity could be safely depended upon than was practicable where coal-gas plant only was worked. This plan also admitted of higher quality gas being supplied, which would meet a very general demand.

The next paper was read by Mr. A. F. Nash; and it dealt with the prevention of errors in reading meters. Many of these were, he said, due to the awkward location of the meter, which, so far as was possible, should be situated in a dry, light place, easy of access. A light, clean, and well-ventilated cellar was a suitable place for the meter; but a dark, damp one, was not. A careful, intelligent man, provided with a good lantern, should be sent to read the index; the employment of incompetent meter inspectors was a mistake.

Mr. W. H. Anson, of Columbus, Ohio, followed with a paper entitled "Should Gas Companies do all the Gas-Fitting?" In reply to the objection that it involved keeping a large stock, the author pointed out that it was necessary in any case to have a stock sufficient for the service laying and meter fixing. In cases where competition had to be met, it was particularly desirable that the Company should be alive to every possible means of advancing their own interests. Then, it had been said that the plumbers and gas-fitters had a direct personal interest in acting as canvassers for the gas company; and this would be lost if the gas company entered into competition with them. This question was dealt with at some length from the author's experience; and he affirmed that in many towns skilled plumbers or steam-fitters looked down upon the gas-fitting, which was done by inferior men at a lower rate of wages. In the case of one plumber he had worked for, the apprentices were left to do gas-fitting jobs. The gas-fitters did the work, but the companies' men had to attend to complaints; and he considered that a man with some experience in the latter department would make a better gas-fitter than one who had not. The gas company, moreover, were much more interested in making a satisfactory job than the plumber. As regarded the question of supervision, it frequently happened that the architect, contractor, or builder, who superintended the construction of a building, had no practical knowledge of gas-fitting. Some instances were cited, in which consumers had applied to the gas company to undertake gas-fitting work, giving as a reason the high prices charged, or the incompetency of gas-fitters. For these and other reasons, he was of opinion that the gas-fitting should be in the hands of the gas company.

Mr. G. G. Ramsdell, in opening the discussion, insisted on the importance of having a set of rules and seeing that they were complied with before fixing the meter. He thought that the plumber or gas-fitter was of very little value as an ally in getting new business; and believed in the gas company undertaking the gasfittings. Mr. Penn agreed with the conclusions arrived at by the author of the paper, as his experience had been much the same. In some cases, the consumers, not having pipes of sufficient size, did not use half the gas they would otherwise take. Mr. Starr also thought that when the gas company did the work, it was much better done. Mr. Anson had formulated a set of rules, but found it difficult to get them carried out. The plumbers would allow the pipes to be laid and plastered over before giving him notice to inspect. Mr. Phillips not only supported the previous speakers, but advocated doing the fitting at as near cost as possible.

"The Present and the Future Tar Market" was the subject of a paper read by Mr. C. H. Welch, of Athens, Ohio, who commenced with a brief historical notice, ranging from the time when tar was regarded as valueless, up to the present, when so many uses exist for it. The prices paid in 1891 had ranged as high as 23s. per barrel net to the seller; and the average price received in the State of Ohio was over 16s. 8d. These high prices were caused by competition amongst the distillers, due to an impression that there would be a scarcity of coal tar. But the enactment of the M'Kinley law removing the tariff from the importation of tar and pitch, and putting both of them on the free list in 1890, had led to the importation of large quantities from England. At the present time, the country was well stocked with foreign tar and pitch; and there was evidence of a remarkable concert of action on the part of tar distillers. The result was that their wells were overflowing, and the prices offered for 1000 barrel lots early in 1892 ranged from 7s. to 9s. per barrel net. The tendency of the market for the immediate future was for lower prices still. But after the present year, the supply would be decreased by the progress of water gas and electricity in replacing coal gas. In England, also, the cheap Russian oil was displacing the dearer cannel. On the other hand, the demand for tar was increasing. It was used for two and three ply roofing, roofing cement, tarred straw board, roofing felt, and paving cement, besides by the distillers. It was hardly fair to blame the free tariff law for the demoralized condition of the tar market, seeing that the duty previously charged was only 10 per cent. on tar and 20 per cent. on pitch. English tar was at present being laid down in New York at less than 12s. 6d. per barrel; and it would continue to be imported and govern the American market, as long as there was a surplus for disposal. The annual production in the United Kingdom was approximately 2,000,000 barrels; in the United States, 700,000 barrels; and in Ohio, 70,000 barrels. It was worthy of consideration whether the establishment of works for dealing with the latter quantity at some central point, by the united action of the gas companies, would not be a good thing. But failing this, the present position might be strengthened by increasing the storeage capacity to two years' output, by acquiring facilities for loading on railways, and by dealing with large quantities through a common agency.

Discussion being invited, Mr. Nash spoke in favour of united action to bring about better prices, and of increasing the storeage capacity. Mr. Penn agreed, saying that "the devil should be fought with fire;" and that as there was a combination to keep prices down, it should be met with one to force them up. In 1891, the tar paid half his coal bill; so it was an important item. He was going to increase his storeage. If less than 8s. 4d. per barrel was the price, it was better to burn the tar.

Mr. Printz agreed with this; and had arranged to store his tar for a year or two, if necessary, in hopes of a rising market. Mr. Padan rather questioned this policy; and thought works large enough to deal with the Ohio production would be impracticable. Mr. Clapp preferred to burn his tar if he could not sell it to advantage. Mr. Marden pointed out that the imported tar was not good for roofing, as the lighter oils had been taken out. In a year's time, he believed prices would be as good as ever. On the motion of Mr. Taylor, a Committee was appointed to get information on this subject, and report at the next meeting.

A paper by Mr. Fred Bredel, of Milwaukee, Wis., on the subject of the "Determination and Regulation of the Proper Proportions of Primary and Secondary Air and Steam in Regenerative Furnaces," was next read. In it, the part played by air and steam respectively in the production of heat in the furnace was followed throughout, and illustrated by analyses of gases taken in practical working. When steam was not used, the author found that the air supply should be divided pretty equally between the primary and secondary inlets, but with a slight excess on the former; and with steam, 40 per cent. at the primary and 60 per cent. at the secondary. The questions of loss of heat by the escaping products of combustion, and of additional heat required for generating steam, were followed out exhaustively. The author's views are in favour of not using more steam than is necessary to facilitate the removal of clinker. In the course of a short discussion, the paper was appreciatively referred to as a useful work of reference for all who were interested in this subject.

After this, a communication from the Society of Gas Lighting, on the subject of uniformity in castings, was read. It was similar to that submitted to the New England Association; and a similar line of action was followed—viz., the appointment of a Committee to co-operate with other Associations in the matter.

Attention was then directed to the "Question Box." In considering the question "Is a gas-engine satisfactory for furnishing power for a small electric light plant?" Mr. Ramsdell referred to the use of gas-engines as large as 100-horse power for that purpose; and Mr. Humphreys stated, on the authority of Herr Oechelhäuser, that engines up to that size had been installed in Germany with eminent success. Mr. Penn raised the question as to whether gas-engines were steady enough; and the President gave instances to show that the "Otto" was perfectly satisfactory in this respect. Colonel Dell's experiences agreed with this; and Mr. Shelton mentioned several places where gas-engines were in use. In reply to a request for information on the proper position of the condenser and scrubber in a water-gas plant, Mr. Shelton said that the United Gas Improvement Company invariably put the scrubber first; so as to remove all the heavy impurities while the gas was hot. In answer to "What is the proper way of making cement joints in street-mains?" Mr. Gwynn said that he first caulked in about an inch of yarn, then put in cement and yarn, and finished off with neat cement. He used pure cement, without admixture with sand. In replying to another question, Mr. Chollar described his plan of using oil as an enricher. An ordinary ¾-inch pipe was carried to the back of a retort, and raised a little at the end, so as to keep the pipe full of oil. The gas was tested at the ascension-pipe by being allowed to play on a piece of white paper. A light spot showed too little oil or too much heat, a black spot the reverse; so the heat and oil supply were regulated to give a brown spot between the two. The wrought-iron pipe would last a year. Mr. Thomson was trying three concentric pipes, so as to cause the oil to travel three times the length of the retort before escaping; but he had not used the arrangement long enough to speak definitely about it.

Several other questions were discussed; and the meeting was brought to a close, after the usual votes of thanks had been heartily accorded.

REGISTER OF PATENTS.

Manufacture of Illuminating and Heating Gas.—Wilson, W. H., of Waterloo, Lancs. No. 5468; March 28, 1891.

This invention refers to the manufacture of gas by the distillation of tar introduced into a heating chamber or duct, and mixing the resulting gases with coal gas in a chamber or duct at a comparatively low temperature. The coal gas is thus "subjected to such a temperature as will effect the required combination, but will not have any deleterious effect upon its illuminating qualities."

In carrying out the invention, according to one mode the tar is introduced into an externally-heated duct or chamber at a high temperature and gasified; while the illuminating coal gas is introduced into a different or separate portion of the same duct or chamber, which is maintained at a much lower temperature (under or about a dull red heat), and there mixes or combines with the gases resulting from the distillation of the tar, which will be still hot—that is, they are not materially reduced in temperature at the moment they combine with the coal gases. In a modified form of apparatus, the combination of tar gases and coal gas may be effected in an entirely separate and distinct duct or chamber maintained at the required low temperature; the tar gases being led thereto by suitable conduits from the tar-distilling chamber or duct; while the coal gas is conveyed thereto in any suitable way—the two gases being so introduced as to effect a proper combination. The gases should, in this case, be artificially cooled upon leaving their ducts or chambers.

Fig. 1 is a sectional elevation of the apparatus; fig. 2 is a plan showing the plant; and fig. 3 is a transverse section.

A is the retort or chamber in which the distillation of the tar takes place; while B is where the coal or other gases used to combine with the tar gases are introduced. C is the conduit by which the combined tar and other gases are led away, and wherein they are cooled artificially by fluid externally applied. D is the trap device by which tar is introduced into the apparatus. E is the pipe by which the combining coal gas (or other hydrocarbon gas) is led into the apparatus. F is the brickwork of the outer wall, in which the apparatus is set. G is a furnace. H are the flues. I are dampers or valves therein, by which the temperature of all parts of the apparatus may be maintained at the required heat.

Fig 1.

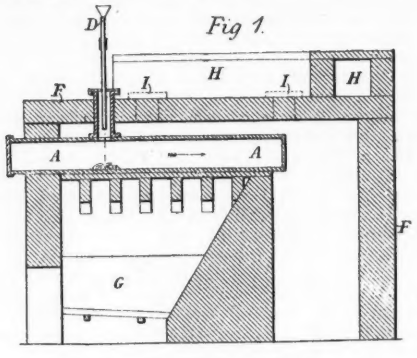


Fig 2.

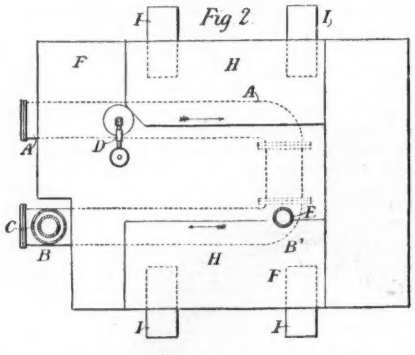
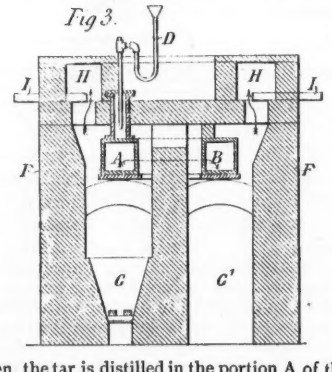


Fig 3.



As will be seen, the tar is distilled in the portion A of the retort; and it is subjected, practically, to the full heat of the furnace gases. Under any circumstances, it must be kept at such a heat as will cause the distillation of the tar to be thorough and effective. From the portion B^1 of the retort—that is, from the point at which the mixing gas is actually delivered into it, to the point of outlet—the retort is surrounded or covered with brickwork, by which this portion of it may be the more easily maintained at a sufficiently low temperature to prevent any destruction or deterioration of the illuminating properties of the gas taking place. The temperature of this part (B) may be kept at, say, about 900° Fahr., or even less. In order to keep comparatively cool this portion of the retort, the heating gases, after they have been used to maintain the retort A at the requisite high temperature, simply pass from the furnace or chamber G to the chamber G^1, within which the retort B is disposed; and from this chamber, the gases pass away to the flue H. It is immaterial, generally speaking, as to what method is adopted in creating the difference of temperature in the various parts of the apparatus, so long as the differential temperatures are such as to effect the ends sought.

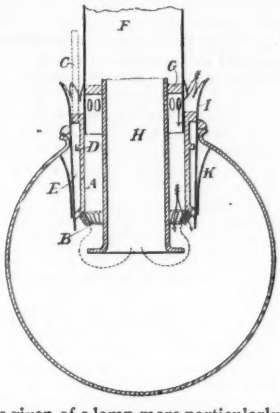
In Fig. 2 a twin retort is employed; tar being introduced and distilled in A, and the hydrocarbon gas introduced and mixed with the tar gases in B.

In some arrangements, whether continuous or separate retorts be employed, the retort or part A may be set at an inclination, and provided at its lower end with a pipe, by which any tar remaining undistilled when it has reached the lower end drains away; the pipe having a liquid seal at its lower end.

Gas-Lamps.—Higginson, W. J., of Liverpool. No. 9370; June 3, 1891.

Lamps under this invention are of the class in which inverted ring-burners within a closed globe are used, in which the flame passes from the burner up a central tube or chimney, and air to support combustion enters the globe through passages surrounding a central chimney.

It is claimed that a lamp constructed according to this patent has the following novel features: (1) An annular casting perforated at its lower end and provided with an inlet way at its upper end, and with one or more partition pieces, all so disposed that, when a tube is driven through or around the casting, an annular gas reservoir and a burner are formed. In some cases the tube also serves as a chimney. (2) An annular deflector is suspended within the chimney; so that air in its passage to the burner flows between the deflector and the walls of the chimney. (3) Passages are arranged, so that air on its way to the burner first descends between the deflector and a partition, and then ascends until it reaches a space from which there are descending passages leading to the interior and exterior of the burner. (4) The fitting of the exterior ring of the lamp with upwardly-extending springs, so disposed as to retain the globe in position, and yet allow of its easy withdrawal.



An illustration is given of a lamp more particularly illustrative of the first, second, and fourth parts of the invention. A is an annular casting perforated at B below to form the burner, provided with an inlet way C at its upper end, and having a partition piece D between the inlet and the perforations. E is a tube driven around the annular casting, so as to make tight joints at top and bottom. F is the chimney, which forms a continuation of the annular casting. Within the chimney is suspended from a ring G a deflector H; and air-ways I are made through the chimney, so that air to support combustion may flow down to the burner between the chimney and the deflector. The globe is held in position by upwardly-extending springs K secured to the tube E, which here forms the exterior ring of the lamp. The air, in its passage down to the burner, becomes heated; and the gas flowing from the inlet way C to the perforations B, is obstructed by the partition piece D, so that the flow is regular and uniform.

Pressure Regulator for Gas-Engines.—Held, H. G., of Almelo, Holland. No. 11,628; July 8, 1891.

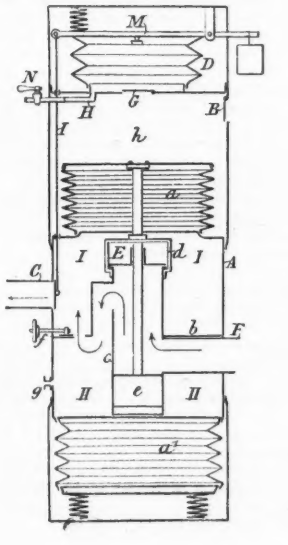
This invention relates to a gas-pressure regulator for the purpose of supplying gas-engines with gas under constant pressure, so as to ensure the formation of a constant explosive mixture. In addition to this, the regulator allows the application of a contrivance which prevents the flickering of the little flame which serves for the ignition of the explosive mixture while the cylinder of the machine is being exhausted, and so prevents the accidental extinction of the flame, and the consequent interruption of working. It also regulates the working of the motor in such a manner that any regulators "become entirely superfluous."

In the vertical section of the regulator, the apparatus is shown to consist of a cylinder A, ending at the top and bottom in bellows a a^1. In the lower part, this cylinder is divided by a partition b, so as to form two chambers I and II. The upper chamber is connected to the cylinder of the engine, by a short tube C; and the lower one to the gas-delivery pipe, by the tube F. The chambers communicate by a tube c, which is open at the top, and is capable of being closed by a valve E. When the upper bellows a expand, the valve is lifted up; but when they contract, the valve closes the cylinder c, thereby preventing the gas-delivery pipe from being affected, or the igniting flame from being thrown into a flickering motion, during the operation of exhausting the engine. The cylinder c communicates, on the one hand, with the gas-delivery pipe by the tube F; and, on the other hand, with the lower bellows chamber through an opening leading from the upper part of the cylinder. To the top of the cylinder is fixed the guide-piece d, in such manner as to allow the valve E to move up and down. Inside the cylinder c, the piston e is situated; its piston-rod passing through the valve E, and being secured to the upper side of the bellows a. The valve E, which is provided with a guiding tube, is fitted over this piston-rod in such manner that, either the friction between the guiding tube and the piston-rod alone, or friction procured by means of a spring, causes it to participate in the upward or in the descending movements of the piston-rod, without, however, interfering with the independent motion of the piston-rod alone. Thus, when the piston is descending, the valve E comes into contact with, and closes the upper opening of, the cylinder c. The partition which divides the two chambers I and II contains furthermore an opening the area of which can be regulated by a slide-valve f. The short tube g is for the purpose of conducting the gas out of the regulator to the ignition flame.

When the motor is in operation, the gas escapes from the supply-pipe into the cylinder c; and from there into the chamber II. through the opening m and the channel i. From the chamber II, the gas passes into the chamber I, through the opening provided in the partition b, and causes the upper bellows to expand. In consequence of this, the upper side of these bellows moves upwards, and with it the piston-rod; and as thereby the valve E is carried along with it, the cylinder c becomes open at its upper end. The gas, therefore, can freely pass from the upper end of the cylinder c to the chamber I. As a consequence of the continuance of the upward movement of the upper bellows, the piston e becomes shifted so as to block up the opening in the cylinder; and the gas can now penetrate into the upper chamber I only through the opening provided in the partition b. Communication therefore between the gas-delivery pipe and the motor is nearly entirely cut off; and the feeding of the ignition flame out of the chamber II takes place in consequence of the pressure which the springs situate below the chamber bring to bear upon the lower bellows a^1. At the same time, the passing of gas from chamber II into chamber I, maintains the balance of pressure, and supplies chamber I with the gas required for the engine.

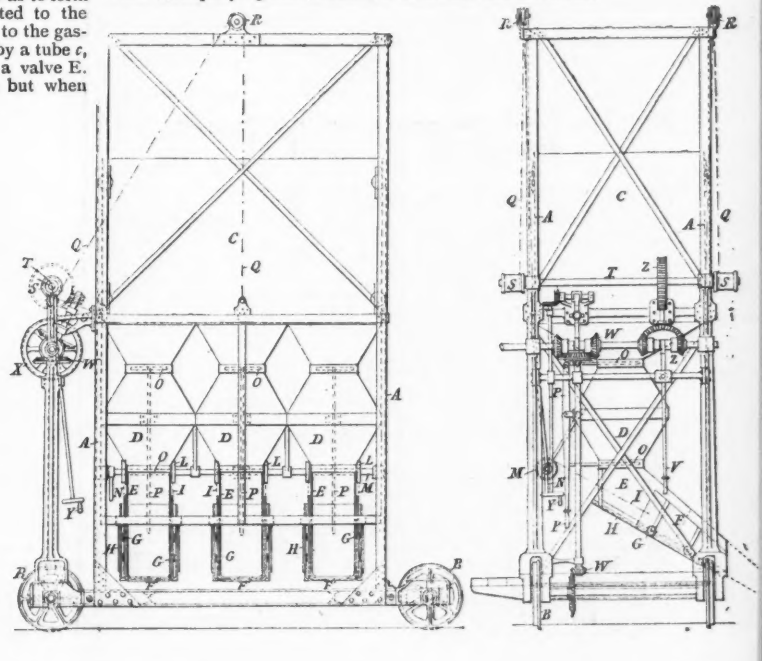
For the purpose of regulating the working of the motor, a valve B is situated at the side, and in the interior, of the casing of the partition h; and on the top of this casing is a valve G, by means of which this partition stands in communication with the bellows D. The expansion and contraction of these bellows causes the pipe C, that conducts the gas to the engine, to become partially or entirely closed or re-opened; and so the working of the motor is modified.

As has been shown, the bellows a contract when the engine is being exhausted; and, in consequence of this, air is drawn into h, through the valve B. which subsequently, when the bellows a are made to expand by the gas pressure, is pressed through the valve G, into the bellows D, which also expand, whilst the valve B closes. In order to allow the air to escape, these bellows D carry a tube H provided with a stopcock N, through which air can pass more or less freely according to the adjustment given to the stopcock. When the engine moves rapidly, the bellows a also expand and contract rapidly; and if the a stopcock N is so adjusted that the air inhaled cannot pass through it as quickly as it is taken in, the bellows D are made to expand and press up the lever M, which acts upon the slide-valve K through the rod J, thereby shutting up the tube C. Consequently, the quantity of gas flowing to the engine is diminished, and its working made slower. The velocity of the engine can, therefore, be regulated solely by adjusting the stopcock N.



Charging Inclined Gas-Retorts.—Stevenson, G. E., of Manchester. No. 12,572; July 24, 1891.

This apparatus, for the charging of inclined gas-retorts, is shown by the accompanying illustrations, in front and side elevation.



It consists of a quadrilateral framework A, mounted on wheels B capable of running upon a rail or tramway laid in front of the retorts at their upper end. Within the framework is a primary, or principal, coal-hopper C, which communicates with three secondary hoppers D below it; each terminating in a fixed shoot E and a sliding shoot F. The sliding shoots are made slightly larger than, but of the same shape as, the fixed shoots; so that they fit outside the latter, and are of sufficient length to bridge the space between the ends of the fixed shoots and the mouthpieces of the retorts. They are mounted on wheels G, running on rails or in channel-iron guides H set at the same angle as the fixed shoots; and they are raised or lowered diagonally and independently of the remainder of the apparatus by chains I attached to their sides, with the other ends wound round drums or wheels L fixed on a shaft M, actuated by a handle N. At the top of each secondary hopper, and also at the bottom (where the fixed shoot commences), are valves O operated by a lever P, and so arranged that, on the upper one being opened, the lower one is closed by a single operation; thus allowing coal to fall from the upper into the lower hopper. By a reverse action of the lever, the upper valve is shut, and the lower one opened, thereby permitting the coal in the secondary hopper to fall into the shoot, and from thence into the retort. Both the principal hopper C and the secondary hoppers D, together with the shoots E and F, guides H, and connected parts, are suspended by chains or ropes Q fastened to the principal hopper, and passing over pulleys R fixed on the top of the outer frame, and then attached to the drums S on the shaft T, so that the hoppers with their shoots are made to rise or fall by rotating the shaft.

The action of the machine is as follows: The hoppers D having been filled with coal, the machine is placed in front of the retorts, and the hoppers are raised to the appropriate height by rotating the shaft T. The sliding shoots F are then allowed to slide forward, so as to enter the mouthpieces of the retorts; whereupon the lever P of each secondary hopper is operated upon, so as to open the lower and close the upper valve O, when the coal will fall into each retort as desired. The lever P being then reversed, the hopper is re-charged with coal; and on the withdrawal of the shoots, the machine may be moved to the next set of retorts to be charged, and the lids applied to those already done.

The machine is made to travel to-and-fro on the rails either by hand or by power. When by power, an endless rope or band passes round a wheel or drum X on the machine, and is driven by any suitable motor. The motion of this wheel or drum is conveyed to the travelling wheels by bevel or other gearing W; the motion being stopped or reversed by a clutch worked by the handle Y. The hoppers and shoots are raised and lowered by hand or power. When by power, the vertical movement is effected from the drum X, through the bevel and worm gearing Z; the motion being stopped or reversed by a clutch worked by the handle V.

APPLICATIONS FOR LETTERS PATENT.

8722.—Martin, E. G., "Safety gas-governor." May 9.
8877.—Hawkins, T., "Gas-engines." May 10.
8892.—Rogers, H. J., "Manufacture of gas for lighting and heating, and for use in gas-engines." May 11.
8957.—Stables, J., "Gas-stoves for heating purposes." May 11.
9114.—Oakman, R. N., jun., "Gas-producing plant." May 13.
9131.—Pease, E. L., "Maintaining telescopic gasholders in their working positions." May 13.
9161.—Robinson, H., "Gas or combustible vapour engines." May 14.
9221.—Williams, H., "Gas motor engine." May 16.
9254.—Heron, T., "Globe-holders and sight protectors for gas or oil lamps; also smoke-consuming and other globes." May 16.
9265.—Hill, F. B., and Brett, R. D., "Utilization of liquid hydrocarbons for lighting and heating purposes." May 16.
9415.—Thompson, W. P., "Gas-regulators admitting gas to gas engines, meters, and the like." A communication from C. Bourne. May 18.
9419.—Williams. H., "Exhausting or drawing away and washing or purifying gas or gases, or products of combustion." May 18.
9439.—Beugger, A., "Petroleum and gas motors." May 18.
9455.—Velna, G. de, "Emulsion of petroleum or analogous hydrocarbons and of compounds thereof with carbonaceous material suitable for fuel, and for the manufacture of gas." May 18.
9459.—Foulis, W., "Obtaining cyanides from illuminating and heating gas." May 18.
9474.—Foulis, W., "Obtaining cyanides from illuminating and heating gas." May 18.
9620.—Bowing, J., "Manufacture of coke and recovery of tar products." May 20.
9624.—Welch, W. H. J., "Gas-burners." May 20.
9664.—Goodman, J., and Barker, A. H., "Gas, petroleum, and other hydrocarbon or liquid fuel engines." May 21.
9674.—Magee, J., "Gas motor engines." May 21.
9698.—Grubb, J., "Sliding gas pendants." May 21.
9766.—Loeb, B., "Apparatus for breathing air containing dust, smoke, or irrespirable gases and vapours, and the like." May 23.
9772.—Taylor, G. H., and Lowe, W. O. A., "Self-contained gas-fired steam generators." May 23.
9779.—Heckel, F., "Water-supply taps." May 23.
9798.—Fraser, J., "Gas or oil engines." May 24.
9829.—Cowan, W., "Apparatus for automatically varying the load and pressure of gas-governors." May 24.
9849.—Pickup, J. H., Byrom, J., and Rigby, W., "Gas-lamps." May 24.
9878.—Thomson, J., "Water-meters." May 24.
9910.—Shrewsbury, C. P., and Dobell, J. L., "Apparatus for electrifying air, gas, or vapour for various useful purposes." May 26.
9938.—Baecker, W., "Process for treating coal tar, to render the same suitable for the production of light gas." May 26.
9985.—Gartrell, J. H., "Appliances for indicating and regulating fluid pressure." May 26.
10,016.—Little, G., "Conveyors." May 26.
10,036.—Irvine, A. K., "Apparatus for heating by means of combustible gas or vapour." May 26.

PARLIAMENTARY INTELLIGENCE.

HOUSE OF LORDS.

Monday, May 30.

WATER COMPANIES (REGULATION OF POWERS) BILL.

On the report of amendments to this Bill being brought up,

The Earl of Wemyss moved an amendment, the effect of which would be to apply the provisions of the measure to corporations supplying water as well as to water companies. He said that, as it at present stood, it was, in his opinion, illogical, inconsistent, and one-sided; and he invited the House to remove these defects. Its object was to give water consumers security against the arbitrary exercise by water companies of the powers they possess under the present law. But the Bill only applied to consumers dealing with companies, and excluded those obtaining a supply from corporations. It was thought, however, only right that the same protection which it was proposed to extend to the customers of companies should be extended to those of corporations. Taking the case of London, his Lordship pointed out that if next year the undertakings of the Water Companies were acquired by the County Council, Londoners would, under this Bill, lose all protection. His noble friend who had charge of the Bill (Lord Camperdown) said the remedy was in the hands of the ratepayers when the elections took place; but he (Earl Wemyss) did not think it mattered much to the consumer whether his water was cut off by Lord Rosebery or by the chairman of a water company. Another consideration entering into this issue was that of private enterprise—of personal *versus* municipal effort. It was private enterprise which had made the country great, and which had brought the water to London. But for this Londoners might now be drinking a decoction of sewage instead of pure water. It was a strong point, when Parliament, in 1847, passed a Bill for regulating the powers of water companies, that no distinction was drawn between the private companies and the corporations. He hoped their Lordships would accept the amendment he had put forward.

The Earl of Camperdown said the Bill did not originally relate to corporations; and it was now proposed to introduce them for the first time. The result would be that the measure, which no one could deny was expedient, would have no chance of passing into law this year. The proper course for the noble Earl to pursue to effect his object was, he submitted, to introduce a Bill next session, placing corporations on the same footing as private water companies; and this would give corporations the opportunity of being heard.

Lord Grimthorpe supported the amendment. He said that they were face to face with this question—whether the British ratepayer was likely to be better protected against corporations than against companies. A corporation was always on the spot to watch any action of the companies, and had no difficulty now in appearing before Parliament. But, on the other hand, when the corporation had a water supply in their hands, there was no controlling power whatever over them; and the ratepayer might feel that he was spending his money at both ends. He (Lord Grimthorpe) did not think it wise to encourage corporations to become the owners of water and gas undertakings. There was greater power, and greater means of exercising tyranny, in the hands of corporations than in those of companies. There was no body more arbitrary than a Bumble corporation. The noble Lord had said that, in case of abuse, the public would have the remedy in their own hands; they could turn out the corporation. But, practically, there was no remedy except by a small man fighting a battle against a great corporation. With regard to what had been said about a postponement of the Bill, if there was to be legislation next year, why not wait until then for a complete Bill?

Lord Henniker, in opposing the amendment, said the Bill was generally in accordance with that which was passed in 1885, and with regard to which the Water Companies were heard. There was a clear distinction between the case of a company, whose chief object must necessarily be to secure profit, and a sanitary authority, as the latter were more likely to have regard to considerations affecting the health of the district. It might be that there were cases in which the sanitary authority might unduly exercise their powers of cutting off water; but the Local Government Board had no facts before them which would support any such contention. It was not unreasonable that, before a measure of the nature of the present Bill was passed, some evidence should be adduced, and the authorities attacked have an opportunity of replying to any allegations made against them. Looking to the period of the session, he might point out that, if the amendment were accepted, it would undoubtedly delay the passing of the Bill; and it was very expedient that it should become law, as it would be of undoubted advantage. In all the new Bills which came before the House, the arbitrary powers of water companies in regard to cutting off the supply were always struck out.

Lord Herschell said, if the amendment was inserted, the Bill ought not to be passed, because it was introduced as affecting water companies only, and the other bodies now sought to be included had not had an opportunity of making any representation.

Lord Norton approved of the proposal that the matter should be deferred until a separate Bill could be brought in.

The Earl of Morley agreed that reason was on the side of the noble Lord who moved the amendment; but he could not support him, because it was inexpedient to wreck the Bill.

After further discussion,

Viscount Cranbrook urged the Earl of Wemyss not to press his amendment to a division, but to accept the almost unanimous opinion of the House that the principle should be extended to corporations. It might be mentioned, in favour of the Bill as it stood, that the water companies did not oppose it.

The Earl of Wemyss expressed his willingness to rest satisfied with the strong expression of opinion in favour of the principle, and withdrew his amendment.

The report of amendments was then agreed to,

Tuesday, May 31.

WATER COMPANIES (REGULATION OF POWERS) BILL.

This Bill was read the third time without discussion, passed, and sent to the Commons.

The following progress was made with Private Bills last week:

Bills read the first time: Birmingham Corporation Water Bill; Exmouth and District Water Bill; London Water Bill.

Bills read a second time: Electric Lighting Orders Confirmation Bills (Nos. 4, 5, and 6),; Gas Provisional Orders Bill.

Bills reported: Airdrie and Coatbridge Water Bill; Gas Provisional Orders Bill.

Bills read the third time and passed: East Grinstead Gas and Water Bill; Gas Orders Confirmation Bill; Ormskirk Gas Bill; Rhyl District Water Bill.

HOUSE OF COMMONS.

Tuesday, May 31.

BIRMINGHAM WATER BILL.

On the order for the third reading of this Bill,

Mr. T. ELLIS moved to re-commit the Bill in respect of clause 53, in order that he might propose to leave out that clause, and insert another, saving certain fishing rights to the inhabitants of the town of Rhayader and district.

Mr. CHAMBERLAIN opposed the motion.

After discussion, the House divided.

For the amendment	67
Against	125
Majority against	—58

On the question that the Bill be read the third time,

Sir H. VIVIAN moved its rejection, on the ground that the constantly increasing population of Wales should be secure of a future water supply.

The amendment was, however, negatived without a division; and the Bill was read the third time.

The following progress was made last week with Private Bills:—

Read the first time: Gas Orders Confirmation (No. 2) Bill; Water Companies (Regulation of Powers) Bill.

Read a second time: Uttoxeter Water Bill; Western Valleys (Mon) Water (Gas Purchase) Bill.

Reported: Ashton-under-Lyne, Stalybridge, and Dukinfield District Water Bill; Glasgow Corporation Water Bill; Pontypridd Water Bill; Swansea Corporation Water Bill; Swinton and Pendlebury Local Board Bill (Lords)—Preamble not proved.

Read the third time and passed: Birmingham Corporation Water Bill; Exmouth and District Water Bill; Ipswich Corporation Bill; Kilmarnock Corporation Water Bill; London Water Bill.

HOUSE OF COMMONS COMMITTEE.

Friday, May 6.

(*Before Mr.* CAMPBELL-BANNERMAN, *Chairman; Sir* W. HOULDSWORTH, *Sir* H. STAFFORD NORTHCOTE, *Mr.* R. K. CAUSTON, *Mr.* S. GEDGE, *Mr.* P. STANHOPE, *Mr.* POWELL WILLIAMS, *Mr.* W. JAMES, *and Mr.* E. H. LLEWELLYN.)

BIRMINGHAM CORPORATION WATER BILL.

On the re-assembling of the Committee this morning,

Professor *Hull* was cross-examined by Mr. BALFOUR BROWNE. He said he advised on the deep-well water system of Birmingham, and was asked to do so with Mr. Hawksley on the King's Vale and Aston bore-hole. The important matter in well sinking was to choose the site judiciously; but engineers generally made a mistake. They themselves selected sites, and then called in geologists to give their support to them; instead of first asking the geologists to select the sites, and then carrying out the work afterwards. Reminded that Mr. Hawksley had stated that one eminent geologist had said the King's Vale well would yield 6 million gallons of water a day, and it had only produced 3 millions, witness expressed surprise. He said he was not aware that it was in consequence of the failure of the King's Vale well that Birmingham had to go to Parliament very soon afterwards to get leave to take water from the Blythe and Bourne. Asked if it did not look as if well water was not the proper kind, when they had to go to overground waters, witness said it did not convey this conclusion to his mind. If he had had the selection of the wells for Birmingham, he did not think there was one, except that at Aston, which he would have selected. The sites were too far west. They ought to have been brought considerably further east. Witness was then cross-examined as to the various districts in regard to which he had given evidence, and as to whether or not he was aware of the extent to which they were already drawn upon by surrounding authorities and companies.

The CHAIRMAN: You say that, if the Birmingham people went farther afield, they would get plenty of water; but for that purpose they would have to obtain parliamentary powers. If this was done, would not the people in the districts upon which they sought to encroach offer opposition?

Witness: In cases of that kind, it is usual to come to terms.

The inhabitants of every individual place would have the right to pump for themselves, I should think. It would be difficult to see how the Birmingham people could encroach upon their grounds?—The plan to be adopted is to keep a distance between the wells of two or three miles.

If they go to Wales and take water that can be spared, no one objects to the water being taken as long as other interests are preserved; but in the case you suggest, there would not be the same free hand given you.—What I should say is that, if you select a site for a well, you ought to keep at a sufficient distance to make it certain that you are not interfering with the supply of existing wells for the sake of yourself as well as others.

In reply to further questions of the CHAIRMAN, witness said he was not prepared to admit that a larger quantity of water might not be obtained from the existing wells by boring from the bottoms of the wells, or by driving out headings; and if this had been done, he had no doubt the present area had been pretty nearly utilized.

Mr. *R. Smallman* said that he was a mining engineer, and had had 40 years' experience in the coal-fields of South Staffordshire, Warwickshire, Leicestershire, and Derbyshire. In the course of his investigations, he had to consider the question of the underground water. He was engaged in sinking a shaft at Exhall Colliery, near Coventry, and at a depth of 106 feet they came to sandstone, which yielded 144 million gallons of water a minute. At a depth of 223 to 321 feet, they came to three layers of sandstone, and altogether they yielded 1500 gallons of water a minute. This was the main water-bearing rock in the neighbourhood. Below the water-bearing sandstone they came to marl and clay which overlay the coal formation, so that it was possible to get the coal under those water-bearing rocks. The 1500 gallons of water a minute would represent 2 million gallons a day; and this went on the whole of the time the shaft was being sunk. The water was good soft water. He had proved these water-bearing rocks along the line of the Warwickshire coal-fields, and found an ample supply of good water. The total sandstone area in the whole district was 200 square miles, and the total capacity was 30 million gallons a day. He estimated that the Birmingham Corporation were pumping daily 10½ million gallons; from private wells some 3¼ million gallons were drawn; the South Staffordshire Company pumped 7 million gallons; Wolverhampton, 3¼ million gallons; and others, 2¼ million gallons—making 27 million gallons. The surplus would be 53 million gallons a day for the supply of the district.

Mr. *F. W. North*, F.G.S., said that, if the permian beds were pierced by any wells or pits after they had dipped under Birmingham, he was certain they would be found saturated with water. Water was never reached in sinking through the outcrop of strata; when the shafts were sunk deeply into the strata, water was met with. Care was necessary in fixing the sites for wells in the permian sandstones. He had heard, and entirely disagreed with, the evidence of Professor Lapworth. He said—and he knew it to be an absolute fact—that there were vast quantities of water in the pebble beds lying to the east of Birmingham; and he was certain that, by a system of deep wells sunk therein, an ample supply of water could be obtained for a long period. He could not accept the area of 35 miles as the whole district within the range of the Birmingham sphere of influence. He quite agreed that, if the area of these deposits stretched wide enough to catch a sufficiently large rainfall, Birmingham would have plenty of water from them alone; and as this could not be, he would propose that the enormous rainfall running to waste off the adjoining impervious rocks of keuper marls should be collected at suitable points, and distributed into a series of wide shallow reservoirs, made without puddle upon the porous rocks, so that 100 per cent. more rainfall should be made by artificial means to rest upon the land where it would be so valuable. By this means, the increased percolation would drown all the existing pumps.

Professor *Wanklyn* said he had studied the Birmingham wells for five years, and had never had any polluted water from them of which he could find any record. So far as his inquiries went, the well water was free from pollution. The Digbeth artesian well, which was situated in the very centre of the city, was a deep spring of water; and he should place it in the first class of his very severe classification of drinking water. To a person who was accustomed to London water, it would appear soft. The immediate hardness was about 6°; but there was a secondary hardness taking a long time to develop, which ultimately would bring it up to about 8° further. If it were desired to soften this water, it might be done perfectly by the Clark process. But for a town supply nothing was needed. He had analyzed the water from the Perry and Witton wells of the Corporation. These waters were a very little harder than the Digbeth water; but in other respects they were everything that could be desired for a town supply. As regarded the alleged deterioration of the well waters, if there was any change at all, deep wells, if they were freely drawn, were expected to yield water containing less mineral matter than when not freely drawn or pumped, unless, as in Liverpool, they were next the sea. As to the quality of the water of the Elan and Claerwen, he had listened to the evidence as to the analyses which had been made, and he said most distinctly that they were utterly inadequate, for the following reasons: The first objection to the analyses of the Welsh waters was that on only three days in the year had samples been taken—only 1 per cent. of the days in the year; and no samples during the summer months. On at least 30 days should samples have been taken. The only two streams—the Elan and Claerwen—had been examined. There must surely be a multitude of streamlets which would feed the proposed six reservoirs. No analysis was made of the untreated storm water. There was no record of any testing for lead and copper in these waters. It was not easy to detect lead in peaty waters; but it could be found. There was a possibility of traces of arsenic being met with in the water; though he did not know that any had been discovered. Commenting on the tabular statement of analyses by Professors Frankland and Dewar, he said the statement conveyed very little information as to the quality of the 25 samples of water, the analysis of which it professed to set out. He objected to the Welsh water because it was peaty, and peaty water produced diarrhœa.

Mr. PEARSON: It is said there would be a great saving in soap by the use of this Welsh water. What is your opinion of the statement of Professor Dewar and Mr. Mansergh as to a saving of £60,000 or £100,000 a year?

Witness (emphatically): It is nonsense. There will be very little saving in soap. In the first place, Dr. Dewar's estimate was a miscalculation, and the figures come out very much lower than he said; but the principle upon which he made his calculation was a much worse blunder. He neglected to consider that human beings are intelligent; and that by the skill we have in using soft water and hard water, we can contrive to produce a lather with very little consumption of soap. As a matter of fact, the substitution of soft water in a hard-water town would cause hardly any saving at all. This Birmingham

water belongs to the softer variety of water, and is not hard in the ordinary sense.

Cross-examined by Mr. BALFOUR BROWNE, witness said he objected to surface water containing peat, and to surface water generally. Loch Katrine was a peaty water; and he did not approve of it. He did not believe that the Vyrnwy watershed was comparable to the Welsh. He had not been to the Elan and Claerwen; but he had heard that a lead mine had been working there for many years, and that lead would be distributed in the streams, and it was quite certain that it would get into the water. Witness's method of analysis was by the albuminoid-ammonia process.

Mr. BALFOUR BROWNE: But do you not know that all the Government analyses are now made by another process?

Witness: Yes, by Dr. Frankland's; and his process is absolutely worthless.

Mr. JAMES: Does Dr. Frankland have the public confidence?

Witness: He is one of the most eminent living chemists, and his general work will live for ever; but his water work will not.

Mr. *E. Chesshire*, F.R.C.S., was afterwards called, and gave evidence as to the excellent quality of the deep-well water in Birmingham.

The Committee then adjourned till the following Monday.

Monday, May 9.

This morning, further evidence was submitted in support of the case of the Birmingham opponents of the Bill.

Mr. *G. Heaton*, the Chairman of the Birmingham Water Company at the time the works were acquired by the Corporation, explained, in answer to Mr. PEARSON, the conditions under which the transfer took place, with the view of controverting a statement circulated that the new water scheme could be carried out "without coming upon the city rates for a penny." He said he negotiated the sale of the works to the Corporation after the passing of the Act of 1875; the consideration being perpetual annuities to an amount to be agreed upon, or, failing agreement, to be settled by arbitration. There was a provision in the Act that the Corporation should, within 95 years from the time it was passed, set apart a sufficient sum for the redemption of the annuities. There had been redeemed £652, and a further sum of £1567 had been set aside up to Dec. 31 last. This was not equivalent to a year's dividend. The annuities outstanding amounted to the sum of £53,789 a year; their market value, according to the last quotation, being 31¼ years' purchase, whereas the Corporation had estimated them at only 25 years. Asked what sum he considered should have been set aside during the past 15 years for the redemption of annuities, witness said that, in accordance with section 27 of the Act of 1875, the Corporation should have made provision, either by instalment or sinking fund, for the redemption of the annuities, so as to be in a position to extinguish them within 95 years from the passing of the Act. This provision ought to have commenced at the expiration of five years from the passing of the Act. The five years expired on Aug. 2, 1880. Up to March 31, 1891, there had expired more than ten full years after the five years mentioned, or more than one-ninth of the remaining 90 years; and consequently provision should have been made for the extinction of one-ninth of the annuities outstanding. The original annuities amounted to £54,491, one-ninth of which would be £6054; leaving a further redemption to be provided for the next ten years of £5422. The Stock Exchange quotations to buyers of these annuities was at least 31½ years' purchase, or representing an approximate value of at least £170,163. Towards the redemption of these annuities, there appeared, by the Corporation accounts to March 3, 1891, to have been appropriated, as he had said, only about £1567; leaving a proportionate deficiency to that date of something like £168,596. At present buyers' quotation, the £1567 represented an annuity of about £50 only; which left the extinction of £53,789 annuities to be provided for out of the water undertaking or borough rate in the remaining 80 years from March 31, 1891.

Mr. PEARSON: Having regard to the reply you have given, do you think it possible for that sum to be provided out of the revenues of the water undertaking without coming on the rates? In your opinion, will there be a further charge on the rates?

Witness: I think there must be a further charge on the revenues of the water undertaking or the borough rate towards the redemption of the annuities. I do not consider that the position of the annuities is strengthened by this scheme.

In further examination by Mr. PEARSON, witness said that, personally, he was not in favour of the scheme, as he considered it was not financially sound. Beyond that, he did not think the quality of the water would be so good as that of the present supply. He did not approve of relying on distant sources of water, as there was liability to interruption by frost, accident, or malicious interference.

Mr. *Beriah Shepherd*, a civil and mining engineer, said he agreed with the evidence given by Professor Hull, Mr. Smallman, and Mr. North, as to the development of the local sources of water. He believed the Corporation might profitably and successfully sink 15 or 20 more deep wells within their present area. He thought with Mr. North that there was an immense volume of water passing to the rivers which might be caused to flow into reservoirs, and then percolate through them into the earth. If the sources he had mentioned failed, there would be an alternative in the double-service system, by which the river water would be supplied by a duplicate main, and used for watering streets, flushing sewers, and manufacturing purposes. There would not, as had been supposed, be two taps in one house. This system would, however, be the last resource. He estimated the expense of duplicating the mains at about £1000 per mile; so that to put down 250 miles of them would cost a quarter of a million of money. He had been consulted by members of the Town Council as to sinking wells, because they said they would not pay another penny for water if the new scheme were carried out.

Mr. GOUGH: It has been represented that by the scheme we shall save £20,000 a year in pumping. Have you any opinion as to that?

Witness: I think the Corporation might save £10,000 a year now out of the £20,000, if they went the right way to work. If you take the proposed scheme, the cost of the present works is put down at £2,014,000, and the projected new works at £6,600,000; making a total capital of £8,614,000. Taking this at 3 per cent., it works out to about £258,420 for interest. Now, take the scheme of the Birmingham people who are opposed to the Corporation. They put down the present works at the same as the Corporation; and 15 wells and plant at £40,000 each would bring the amount up by £600,000, or a total of £2,614,000. The cost of pumping 40 million gallons of water a day from the streams would cost £41,062; and he estimated that there would be a balance of £138,838 in favour of pumping. The money could be spent as required.

In cross-examination, witness admitted that what he had done in connection with pumping had been in his capacity of a colliery engineer. His suggestion was that there should be reservoirs in which the water would be collected, and that these should be leaky, so as to allow the water to pass through into the earth, whence it could be pumped at some distance below. This notion, he acknowledged, had the merit of originality. With regard to the dual supply which he had advocated as a last resource, he admitted that all the machinery would have to be provided before the system could be used; but, if not wanted, it would not be put down. The desire of the opponents of the Bill was to show the Water Committee that they had ways and means of supplying themselves, without putting the population to the extra expense of £210,000 per annum.

Mr. *W. Matthews*, M.Inst.C.E., Water Engineer to the Corporation of Southampton, said that during the eight years he had held this position a duplicate system of water supply had been in use in the town. Since 1883 the secondary system, which supplied the water used for sanitary purposes, had been largely increased. There were now about seven miles of mains in use for this supply. The domestic water was derived from deep chalk wells; and it was pumped, after being softened, to Southampton. The water for sanitary purposes was derived from the drainage from Southampton Common, and from a well situated at the same place. It was unfit for domestic use. It was sent into the town by gravitation, at a low pressure. The daily average supply for domestic purposes was 2,250,000 gallons per diem; and for sanitary purposes, from 50,000 gallons daily in winter, to 200,000 gallons in summer. Only about one-eighth of the total number of streets had the secondary mains—the supply being insufficient to serve more; otherwise he should be glad if it could be extended all over the town. The working expenses were very small. Where available, it provided for flushing sewers, cleansing courts and alleys, and watering roads. It was also an auxiliary supply for fire brigade purposes. The secondary supply was absolutely confined to the streets; but he saw no objection to its being taken into the houses for use in water-closets. It was also fitted for manufacturing purposes. In the year 1884, Deacon's waste-water meters were introduced; and the average daily consumption had been reduced 50 per cent. He was of opinion that it was quite possible to introduce similar meters in Birmingham, where they would effect a great saving of water. He thought, for the purpose of a dual supply for Birmingham, an additional length of 250 miles of mains and branches would be sufficient, the cost of which would not exceed £250,000. He had examined the deep wells; four of which—at Aston, Witton, and King's Vale—he was informed, practically yielded 7 million gallons of water a day. There were a large number of private wells in the neighbourhood, from which he learnt that considerable quantities of water were pumped daily. He was told the Aston well overflowed if pumping were suspended. There was also the Perry Colliery shaft overflowing in the neighbourhood; and the Digbeth well also overflowed. The fact that those overflows took place after years of persistent pumping of the large quantity of 7 million gallons per day, proved that the limit of pumping from these sources had never been anything like reached. He was certain that a large supply of water could still be obtained from that neighbourhood. He thought two more wells might be sunk in suitable positions; and if headings were driven from them, they might be reasonably expected to yield 3 million gallons each daily. The water of the Tame at Bescot was, in his opinion, fit for the purposes of a secondary supply.

Cross-examined by Mr. BALFOUR BROWNE, witness said he had only spent three days in Birmingham, and did not communicate with Mr. Gray, or any of the officials of the Water Department. He would not recommend a dual supply for such a town as Southampton. The cost of the double-service system—£1000 per mile for 250 miles of pipes—was not for leading, but distributing mains. They would not necessarily need more than one leading main.

Mr. *H. Lane*, a mechanical engineer, of Birmingham, gave evidence with respect to the state of feeling in the city concerning the scheme. He said the people were alarmed at it; and 90 per cent. of the ratepayers would vote against it if called upon.

Mr. *E. Fletcher* corroborated the statement that the feeling against the scheme was now very strong,

The CHAIRMAN said it was possible, when the evidence given by the parties opposed to the Bill was completed, the Committee might call one or two witnesses on the general question—possibly from a Welsh point of view. It would be well, he thought, that they should give their evidence before Mr. Pope replied. The Committee had listened very carefully, and with great interest, to all that had been said as to the possibility of finding water in or near Birmingham; and he had to state to Mr. Pope that they thought it would be unnecessary for him to bring rebutting evidence as to the possibility of augmenting the present supply from this locality. The general question, however, was still left open.

Tuesday, May 10.

To-day the case of the Birmingham dissentients was closed.

Mr. GOUGH said he should like to call a witness or two as to the quality of the Welsh water. He had called Mr. Wanklyn; but that gentleman had not been over the ground, and could only speak in general terms. Mr. Lloyd, barrister, who had appeared in several cases before the Committee, was perfectly well acquainted with the Welsh watershed; and he (Mr. Gough) thought his evidence would be material.

The CHAIRMAN said he did not think the Committee could take evidence of that kind. He might add that he had arranged with Sir Hussey Vivian, M.P. for Glamorganshire, and Chairman of the County Council, to attend on the following day to give evidence as to his views

on the matter from a Welsh stand-point. Certain other witnesses would be called; and their evidence would cover all Mr. Gough desired. He (the Chairman) thought it would be better to get it in that way. If Mr. Gough wished to give technical, expert, or chemical evidence, he did not suppose the Committee would refuse; but he did not consider that any other testimony would be of value.

Mr. *E. W. Forrest*, a chartered accountant, of Birmingham, was then called and examined by Mr. GOUGH. He produced tables to show that the calculations of the promoters were erroneously based. He said the income in the future, judging by the experience in the past seven years, would not grow in anything like the same ratio as the consumption. In preparing the tables, he had taken the promoters' own figures as to consumption and expenditure. The result was that, instead of an accumulating surplus equivalent to a reduction of 10 per cent. as from 1932 to 1943, and to a reduction of 20 per cent. as from 1943 to 1955, as appeared by the promoters' table, there would be no surplus at all, but a deficiency of £1,469,754 at the end of the period. The promoters' table assumed that every gallon of water would be paid for at the same rate as at the present time; but past experience did not, he said, justify this.

Mr. GOUGH announced that this concluded his case. He added that, with regard to the Birmingham opposition, it had not been in any sense a factious one. The opponents sincerely believed that there had not been sufficient inquiry into the possibility of developing the local sources of water. But for the Birmingham opposition, there would have been no real obstacle in the way of the Bill; and he had been able to put before the Committee a number of facts which he thought it necessary for them to know in order to enable them to arrive at a right conclusion. He asked the Committee to take into consideration the question of paying his costs.

Mr. POPE said Mr. Gough was obviously not aware of the practice of Parliament in regard to these matters. The Committee could not allow costs.

The CHAIRMAN said the Committee, the promoters, and all the parties to the Bill, were indebted to the Birmingham opposition for the facts they had brought forward, and the light they had thrown upon their side of the question.

The Committee then adjourned until the following day, when Sir Hussey Vivian, Bart., M.P., Mr. T. Howard Ellis, M.P., Dr. E. Frankland, Professor Dewar, and Mr. J. Mansergh were examined. The Committee adjourned till the following Friday, when Mr. Pope replied for the promoters. At the close of his address, the Committee passed the preamble of the Bill in an amended form. On the 17th and 18th ult., the clauses were considered; and the Bill was subsequently reported to the House. Its further progress is recorded elsewhere.

LEGAL INTELLIGENCE.

HOUSE OF LORDS.

Monday, May 16.

(*Before Lords* HERSCHELL, WATSON, MORRIS, *and* FIELD.)

Young and Beilby v. The Hermand Oil Company, Limited.

This was an appeal from the Second Division of the Court of Session in Scotland, lodged by Messrs. William Young and George Thomas Beilby against the respondent Company under the following circumstances: The Hermand Oil Company, in March, 1886, took out a licence from Messrs. Young and Beilby to use four of their patented inventions, on terms of paying a royalty of 10 per cent. "on the value of the excess of sulphate of ammonia obtained from the ammonia distilled or manufactured in apparatus or retorts made or worked according to the principles of the inventions set forth in the patents." Under this licence, the Company erected 160 shale retorts, which, it was alleged by the present appellants, were worked according to the principles of their inventions; and they therefore claimed the royalty mentioned. This the respondents refused to pay, on the ground that the retorts in question were not within the licence; and their contention was sustained by a majority of the Court of Session. Hence the present appeal, which resulted in a reversal of the decision of the Court below, with costs; the House of Lords declaring that "the retorts in question are within the principle of the patents which the respondents are entitled to use, and that the case be remitted to the Court of Session with this declaration, in order that the amount of royalties due to the respondents upon the produce of these retorts may be ascertained."

Lord HERSCHELL, in the course of an elaborate judgment, said that although the licence extended to four patents, it was only necessary to call attention to two of them—Mr. Young's patent (No. 1587) of 1881, and Mr. Beilby's (No. 2169) of the same year. In order to appreciate properly the patents which had to be considered, it was necessary to bear in mind what was the process of shale distilling in use prior to 1881. The retort commonly used was a vertical one, about 10 feet in length, through which the shale passed in about eight hours. The only object in view was the production of oil; and it was endeavoured to keep the retort at a temperature suitable for the distillation of oil. The temperature appropriate for that purpose was said by Mr. Beilby to range from 650° to 800° or 900° Fahr., though one of the defenders' witnesses put the range considerably higher. If an excessive temperature was applied, the oil produced was deteriorated in quality. In the process of oil distillation, a certain quantity of ammonia was produced by the combination of the nitrogen and hydrogen constituents found in the shale. It was the practice to introduce steam into the lower part of the retorts, with the object of sweeping the oil vapours rapidly out of the retorts, so as to avoid their decomposition. But while the object of the introduction of the steam was merely mechanical, it would appear to have added somewhat to the production of ammonia, owing to the combination of a small portion of its hydrogen with the nitrogen of the shale. Another retort in use prior to 1881 was known as Henderson's. It was about 15 feet in length; and the shale remained in it a longer time subject to heat. In its working, it did not differ very materially from the common vertical retort; but there was an increased yield of ammonia, though the increase was not very marked. Under these circumstances the idea appeared to have occurred to Mr. Young and Mr. Beilby at about the same time that, if a temperature in excess of that which would be appropriate to the distillation of the oil could be applied to the shale after it had parted with all or most of its oil, a largely increased yield of ammonia would result, without prejudice to the oil distillation; the higher temperature being more favourable to the decomposition of the steam, and thus setting free the hydrogen for combination with the nitrogen of the shale. Inasmuch as the judgments adverse to the pursuers had been founded upon a construction of their specifications with which he found himself unable to concur, his Lordship said it would be necessary to examine somewhat minutely their language. There was abundant evidence that, by the use of Messrs. Young and Beilby's retorts, the yield of ammonia was practically doubled, and this without any diminution of the quantity, or deterioration of the quality of the oil obtained; and in addition to increased yield of ammonia, there was a very great increase in the volume of the uncondensable gas set free. In the Henderson retort, the volume of uncondensable gas set free per ton of shale was 2500 to 3000 cubic feet; while in the Young and Beilby retorts, it was augmented to 10,000 to 15,000 cubic feet per ton. To his mind these facts established the existence of a new factor in the process of distillation by means of the latter retorts. In proceeding to an examination of the specifications of the patents of 1881, his Lordship, at the outset, remarked that Young's patent appeared to embrace, not only a particular form of retort, but a process to be applied in the distillation of shale, together with the appropriate apparatus; and Beilby's, he thought, showed an improved method of carrying out the process. This was very material, because, in considering whether the use of a particular apparatus would be an infringement of the patent or was within the licence, the conclusion might be different if the patent covered a process to what it would be if a form of apparatus merely were claimed. His Lordship then read Mr. Young's own statement of his invention, and observed that it was only necessary for their Lordships to concern themselves with the process as carried out in a single retort. As described by Mr. Young, it was an intermittent process—that was to say, the whole of the lower half of the retort was emptied at once, and the contents of the upper part were then let down into the lower. Beilby proposed operating on the shale in a practically continuous manner; small portions of the exhausted material being removed at the bottom, and fresh material introduced at the top at frequent intervals. But the system was avowedly the same. In his specification, Mr. Beilby acknowledged that, after he had applied for letters patent, he learned that it had been proposed to effect the distillation of shale or other similar substances at two temperatures; and then he stated his claim as follows: "The improved system or mode of distilling shale or other oil-yielding minerals, wherein the materials are passed through the retorts in a practically continuous manner, and wherein the distillation of the oil is effected in the upper parts of the retorts at a suitable moderate heat, wholly or to a great extent by the heat or action of vapours or gases passing up from the lower parts of the retorts, in which lower parts the 'spent' shale is being subjected to a comparatively high heat for the purpose of increasing the yield of ammonia, and thereby enhancing the value of the aggregate products." It was clear that Beilby saw in Young's specification the disclosure of a new system of distillation. What was that system? The Lord Ordinary regarded as claimed the application of two distinct temperatures, each applied to its own portion of the retort—one uniform temperature appropriate to oil distillation in the upper part of the retort, and a second uniform temperature appropriate to the production of ammonia in the lower part of the retort. Lord Rutherfurd-Clark took much the same view. It was evident that both the learned Judges thought it was the essence of the system that each half of the retort should be kept heated throughout to the same temperature—that of the lower half exceeding greatly that of the upper. They saw, of course, that it might be impossible that there should be any distinct line of separation; but they thought that the object of the patentee was to obtain this result, and that the apparatus was designed to secure it. He (Lord Herschell) might say at once that, with all respect, he was unable to agree with this. To keep each half of the retort heated throughout to the same temperature, would be a physical impossibility. Supposing a line to be drawn across Beilby's retort where the fire-clay construction ended and the iron began, the heat of the shale immediately above and below that line must, of necessity, be substantially identical. All that the patentees could desire would be that the temperature in the upper half of the retort should be within, and not in excess of, the range suitable for oil distillation. In the lower half, on the other hand, it was desirable that the heat should exceed the oil distillation range—not necessarily to the very top of that half of the retort, for this might cause the temperature in the upper half to be unsuitably high, but in a sufficient portion of it for the successful acquisition of the ammonia. This, he believed, was the system the patentees intended to describe; and the end they sought to attain. In considering next the nature of the retorts at the Hermand works, and the mode in which they had been used, his lordship said the hopper arrangement differed somewhat from that of Messrs. Young and Beilby, and the products of distillation were led away at a different part. But it was not suggested that these variations were material. No stress was laid, or could be, on the fact that the distilling column was about 5 feet longer. Nor was it suggested that there was any substantial difference in the lower half of the retort, or in the place at which, or purpose for which, the steam was admitted. Reliance was placed upon the contrast presented by the upper half of the retort to the Young and Beilby arrangement. Instead of this part being made of iron, it was constructed of fire-brick, and the hot gases were led round the retorts by a series of flues reaching to the top of the distilling column. It was true that there would be a gradation of heat in the upper part of the retort, and that there would be no sudden change in temperature in passing from the lower to the upper half. But precisely the same must be the case in the Young and Beilby retort; and, as he read the patents, nothing different was indicated. It appeared certain that, with suitable firing, the Hermand retort might be so worked that in the upper half the temperature should

rise to, and never exceed, the range of temperature suitable for oil distillation; while in the lower half the range of temperature should be much higher, so as to secure there an active decomposition of steam. If, as he thought, this was the process first made known by Messrs. Young and Beilby, the changes made in the form or substance of the retort would be wholly immaterial. The question remained, Had the Hermand retorts been in fact worked according to the principle of the pursuers' inventions? The first fact to be remarked was that the results produced with the Hermand retorts, so far as the products were concerned, were identical with those obtained in the Young and Beilby retorts. The defenders, who had used the retorts at Hermand for a considerable time, had not given the amounts of ammonia and oil which they yielded as compared with the produce from the same shale distilled in the Young and Beilby retorts. But there was evidence that the uncondensable gas generated was substantially the same; and one of the defenders' witnesses said he thought it might be taken that the results obtained by the Hermand and the Young and Beilby retorts were practically identical both as regarded the yield of oil, ammonia, uncondensable gas, and ammoniacal liquor. This was strong evidence, and showed that the same process was employed in both sets of retorts, and that they were worked in precisely the same way. The identity of the result obtained was not without its bearing too on the contention that the increased yield of ammonia in the Young and Beilby over the earlier retorts was to be attributed to the increased length of the retorts, and the longer period during which the materials remained under treatment in them; for the distilling column of the Hermand retort exceeded the Young and Beilby in length by 5 feet, and the shale was under treatment for 42 instead of 18 hours, without any change in the result. A witness, whose evidence was adopted in one of the judgments below, stated that he examined the heat in the Hermand retorts through the spy-holes; and at the bottom it was a very bright red heat, almost approaching white, at the top it was a faint red heat, and in the intermediate spy-holes the heat appeared to gradually diminish towards the top. This indicated that the temperature in the lower parts of the retorts was much higher than in the upper. Again, pyrometric tests were applied, at which both parties were represented, to ascertain the temperature in the flues at various points, both of the Young and Beilby and the Hermand retorts. The flues of the Hermand retort divided its length into six approximately equal parts. In the lowest of these, the temperature was 1550°; in the second, 1340°; in the third, 1125°; in the fourth, 1070°; and in the fifth, 970°. The sixth was not accessible; but, judging from the temperature at the flue, it was put by Mr. Beilby at 930°. In the Young and Beilby retort at Oakbank, the temperature in the two lower flues, which did not extend quite half way up the retort, was 1450° and 1400° degrees respectively. In the upper chamber, it was 1050° at the bottom, and 750° near the top. Thus, in the Hermand, the mean of the three upper temperatures was 990° Fahr.; and the mean of the upper part of the pursuers' retort was 900° Fahr. The mean temperature of the three lower compartments in the defenders' retorts was 1465° Fahr.; and in those of the pursuers, 1425° Fahr. The maximum temperature at the lower part of the upper half of the retort was, in the Hermand 1070°, as against 1050° in the Young and Beilby; whilst the temperature in the lower part of the other half, was 1550° as against 1450°. If, then, the outside temperatures were any approximate indication of those prevailing inside at the same part of the retort, it was impossible to deny that there was a marked correspondence in the two retorts. But it was contended that this was not the case, that the heat inside the lower part of the retort was not the greatest, and that the shale was not at any stage of its progress subjected to the heat indicated in Young and Beilby's patents. It was said, further, that in the Hermand retorts the distillation of the oil and the production of the ammonia proceeded concurrently throughout the whole of the retort—that the oil was not first distilled, and then the ammonia obtained at a heat greater than would be suitable for oil distillation, and that therefore the pursuers' process was not adopted. The defenders explained the alleged fact that the temperature inside the lower part of the retort did not correspond with the high temperature exhibited in the flue outside, by the suggestion that the steam which was admitted to that part of the retort not being superheated would have a cooling effect. This was no doubt true; but whether—considering the high temperature prevailing outside, and the great heat of the material inside, with which the steam came in contact—the effect would be very substantial, was matter of theory. In support of the theory that it was so, the defenders relied upon certain pyrometic tests in the interior of their retorts, and upon the condition in which some shale was found to be when drawn from the lower part of the retorts. But no opportunity was given to the pursuers of being present when those tests were made; and, under the circumstances, he could attribute little or no weight to that evidence. It was alleged by defenders' witnesses that shale drawn almost from the bottom of the retorts when the process was nearly complete was found to be full of oil. This was certainly a remarkable phenomenon; but how came it, asked his Lordship, that the shale, if it had been subjected for forty hours to the temperature spoken of, should remain thus full of oil? None of the witnesses, to his mind, gave even a plausible answer to this question. It was also said that the heat applied at Hermand was below that which the specifications directed should be applied to the Young and Beilby retorts. The words relied on were to be found in Beilby's specification, where he stated that his object in applying a bright red or slightly higher heat to the fire-clay tubes was that all, or a large part, of the fixed carbon remaining in the shale "might be converted into carbonic oxide." It was alleged that analysis showed that the heat applied was not sufficient to evolve a large quantity of carbonic oxide; the product being principally carbonic acid. Looking at the whole specification, his Lordship was unable to regard it as of the essence of the invention that the heat should be sufficient to ensure the bulk of the product being carbonic oxide and not carbonic acid. The heat to be applied was described as "bright red, or slightly higher;" and there was distinct evidence, as he had pointed out, that at the bottom of the Hermand retort it was "a very bright red heat." Moreover, and this was, he thought, conclusive, Mr. Young, who first described the process, indicated as the result of the decomposition of the steam the formation of carbonic acid and carbonic oxide gas. Supposing Beilby was under the erroneous impression that the bulk of it would be carbonic oxide, that was, in his Lordship's opinion, wholly immaterial. He had carefully studied the whole of the evidence; and the result had confirmed his opinion that the Hermand retorts were worked according to the principles of the invention set forth in the pursuers' patents, and that the interlocutors must be reversed, and the cause remitted with this declaration, in order that the royalties to which the pursuers were entitled might be ascertained.

Lord WATSON, in his judgment, said the two patents which had been referred to must be construed as one for the purposes of this case; and when so read, he was of opinion that they included a process for the effective recovery of the maximum amounts of oil and ammonia obtainable from the distillation of shale—a process which consisted in passing the shale, more or less continuously, through a single retort, in which it was first exposed to a range of temperature suitable for distilling oil, and secondly, to a range of higher temperature suitable for producing ammonia—and that they were not limited to apparatus for carrying that process into effect. It was not disputed that these inventions had attained the object which the patentees had in view, and that they were, consequently, of great practical value. There was abundance of uncontradicted testimony to that effect; and their commercial utility was demonstrated by the fact that in July, 1890, at the time when the proof was taken, twelve of the leading companies or firms (including the respondents) who distil shale in Scotland, were using, by licence from the appellants, no less than 3252 of their patented retorts. According to the construction which he attached to the appellants' patents, the retorts, for the produce of which the respondents refused to pay royalties, constituted a plain infringement of the patented process of distillation. He thought it was equally clear, upon the evidence, that the respondents' retort was merely a colourable imitation of Mr. Beilby's retort, which was one of the patented methods of carrying out the process. On comparison, he could find no substantial difference between the two, either in their construction, in the principle upon which they worked, or in the results which they produced. Concerning the construction, the two retorts were absolutely identical, with this exception only, that in the zone of the respondents' retort fire-clay was substituted for iron, and the fire gases were brought into contact with the upper as well as the lower zone. Now the mere substitution of fire-clay did not, in his opinion, constitute an essential *differentia;* and the continuation of the course of the fire gases to the top of the retort, which was, no doubt, rendered necessary by the fact that fire-clay was less pervious to heat than iron, was a device described in Beilby's specification. As regarded the principle of working, the heat tests taken by the pyrometer, in presence of both the parties, showed that, starting from the top of the respondents' retort and going downwards, the temperature of the upper zone (which nearly corresponded with the iron part of Beilby's retort), ranged from 910° Fahr. to 1070° Fahr., and that of the lower zone from 1070° Fahr. to 1550° Fahr. These temperatures gave a suitable oil-producing heat in the upper, and a suitable ammonia-producing heat in the lower zone, which was the very marrow of the appellants' invention. Professor Foster, one of the respondents' witnesses, who had examined the working of the retorts, as well as that of the appellants' retorts at Pentland and elsewhere, on being asked whether there was any difference between the two processes, candidly replied that the process was similar to that practised in the distillation of shale and the like, and quite contrary to anything he expected to find. Lastly, the results yielded by the two retorts were practically the same, as one would naturally expect to find if they were worked with the same degree of care. Another of the respondents' witnesses (Mr. W. Fraser), who had had great experience in the manufacture of shale oil, said he thought it might be taken that the results obtained by the Hermand and the Young and Beilby retorts were practically identical, both as to the yield of oil and the yield of ammonia. In conclusion, his Lordship said he thought they ought to reverse the interlocutors appealed from; to declare that the retorts in question were within the principle of the patents which the respondents were licensed to use; and to remit the case to the Court of Session in order that the amount of royalties due by the respondents upon the produce of these retorts might be ascertained, and decree for that amount pronounced in favour of the appellants. The appellants, in his opinion, ought also to have their costs of this appeal and their expenses of process in both Courts below.

Lord MORRIS and Lord FIELD concurred in the above judgments.

Monday, May 23.

(*Before the* LORD CHANCELLOR, *and Lords* WATSON, MACNAGHTEN, MORRIS, *and* HANNEN.)

Sir Robert Herron and others v. Rathmines and Rathgar Improvement Commissioners.

The Construction of Reservoirs on the Dodder.

This was an appeal from an order of the Court of Appeal in Ireland, reversing a judgment of the Master of the Rolls. The original action was brought by the appellants on behalf of themselves and all other persons in the Rathmines and Rathgar Water Act, 1880, called the upper mill-owners, for an injunction to restrain the present respondents from continuing to carry on certain works, and from interfering with the flow of water in the River Dodder. The question before their Lordships was the construction to be given to certain sections of the Act, which authorized the respondents to impound water from the Dodder and its contributory streams, and for this purpose to build certain reservoirs, the design, capacity, and position of which were duly specified in the Bill. The appellants contended that the reservoirs and other works that have been constructed by the respondents did not satisfy the conditions set out in the Act; that their rights in the water supply to their mills were insufficiently secured; and that the motive power to the mills would be injuriously affected.

The ATTORNEY-GENERAL (Sir R. E. Webster, Q.C.), and Mr. R. M. BRAY appeared for the appellants; Mr. RIGBY, Q.C., Mr. FITZ GERALD, Q.C., and Mr. D. FITZGERALD for the respondents.

The case was heard by their Lordships at the previous sittings, when judgment was reserved.

The LORD CHANCELLOR pointed out that the case involved the principle of construction of all Private Bills, and that Parliament, in passing a Private Act, looked to the public advantage and security and to the interference with private rights. He fully agreed with the Master of the Rolls that deviation from plans could not mean deviation from that which was not alone shown on the plans, but was the subject of express enactment of words and definition by measurement. If a power were intended to be given of altering the site or diminishing the capacity of the intended compensation reservoir, subject only to the test that it should enable the Commissioners to give a sufficient supply of compensation water in the terms of the Act, nothing could have been easier than to say so in plain terms. Undoubtedly the design and purpose of the Act, as expressed in its own terms, was that No. 1 reservoir should supply drinking water to the district—while the design of No. 9 reservoir was specially for compensation water to the mill-owners; and he could not place a construction on this statute which was never contemplated by its author. He therefore moved that the order of the Court of Appeal be reversed, and that the injunction ordered by the Master of the Rolls be restored.

Lords WATSON and MACNAGHTEN, in their judgments, concurred with the opinions expressed by the Lord Chancellor.

Lords MORRIS and HANNEN dissented.

The appeal was therefore affirmed; the respondents to pay the appellants' costs, both here and in the Court below.

HIGH COURT OF JUSTICE—QUEEN'S BENCH DIVISION.

Wednesday, June 1.

(*Before Baron* POLLOCK *and Mr. Justice* VAUGHAN WILLIAMS.)

In re an Arbitration between the Kirkleatham Local Board and the Stockton and Middlesbrough Water Board.

This was a special case stated for the decision of the Court under the following circumstances: In the year 1876 an Act of Parliament was obtained by the Stockton and Middlesbrough Corporations for the purpose of acquiring the then existing local Water Company, with power to supply the whole of the district covered by the Corporations, which included amongst others the parish of Kirkleatham. There was a provision, however, that any of the outlying districts—that is to say, districts not included within the limits of the boroughs of Stockton and Middlesbrough—were to be at liberty, on giving notice to the Joint Water Board, to supply their own district with water, in which case they were to purchase the mains, pipes, and fittings in the district at a price to be fixed by an arbitrator in case the parties could not agree. The Kirkleatham Local Board, in 1891, acted upon this statutory power; and accordingly the matter was referred to the arbitration of Mr. Henry Law to decide on the price to be paid for the mains, pipes, and fittings. The Kirkleatham authorities were not satisfied with the price he fixed, and obtained an order for him to re-state his award in the form of a special case for the opinion of the Court; and this he had now done.* He stated that he had fixed the price at £25,424; the parties bearing their own costs and paying half the costs of the award. There were two rival contentions put before him, as to the principle on which the price should be ascertained. It was contended on behalf of the Kirkleatham Local Board that the basis of calculation should be merely the value of the mains, pipes, and fittings regarded as plant *in situ*, capable of earning profit, which was to be arrived at by taking the cost of the mains, laying them down, making good the ground, &c., deducting a certain sum for depreciation; and that he had no jurisdiction to take into consideration at all the present or prospective earnings of these mains and fittings. On the other hand, it was contended, on behalf of the Water Board, that the value must be taken as the value to the seller, not the value to the buyer; and as the sale was coupled with an obligation on the part of the Board to supply water within the Kirkleatham district, what the Joint Water Board were really parting with was the power of earning revenue from the supply of water, and that at all events the value to them of the mains and pipes was to be measured, not by the cost of manufacturing and laying them down, but by the returns obtained from them. The Arbitrator held that, having regard to the whole scheme of the Act of 1876, it seemed to him that the contention of the Water Board was the correct one; and he had, therefore, capitalized the average net revenue earnings by the Board in the Kirkleatham district for the seven years ending August, 1891—making all proper deductions for working expenses, maintenance, and so on, and further deducting the Kirkleatham district's proportion of the revenue earnings. This brought out the figure £25,424, which did not include any amount in respect of prospective increase in the revenue. If the Court should be of opinion that this was the correct basis, the award would stand for that amount; but, on the other hand, if the basis contended for by the Kirkleatham Local Board should be held to be correct, the amount would then be reduced to £8006.

The ATTORNEY-GENERAL, Mr. BALFOUR BROWNE, Q.C., Mr. SCOTT FOX, and Mr. CLAUDE BAGGALLAY appeared for the Joint Board. Mr. FINLAY, Q.C., and Mr. WOOD, of the Chancery Bar, appeared for the Kirkleatham Local Board.

The question having been argued at some length by the ATTORNEY-GENERAL, by Mr. WOOD, and by Mr. BALFOUR BROWNE in reply,

Baron POLLOCK, in giving judgment, said the question submitted to the Court very clearly by the Arbitrator was whether or no he had assessed the amount to be paid by the Local Board on the correct basis. In the year 1876, there being an existing Water Company, and there being a desire on behalf of two Corporations who were interested in the joint supply of water made by that Company to acquire for themselves the power of supply, and Parliament being minded to give to the two Corporations the power of being their own suppliers of water, an Act was passed whereby the two Corporations were empowered to acquire the whole undertaking, property, rights, and powers of the Company. That might be called the first object of the Act. By section 4 it was provided that the limits of this for the supply of water should comprise the previous Company's present limits and certain parishes and townships mentioned in the schedule; and in that schedule was included the parish of Kirkleatham. Then came the important proviso: "Provided always that the Joint Board shall, when so required by the Sanitary Authority of any district beyond the boundary of the boroughs of Stockton and Middlesbrough sell to such Sanitary Authority all mains, pipes, and fittings belonging to the Joint Board within that district (excepting any mains, pipes, and fittings used for service beyond the limits of the district) at a price to be fixed, in default of agreement, by arbitration; and after such sale the Joint Board shall cease to supply water within such district." Under this clause the arbitration took place; and two contentions were placed before the Arbitrator. It was contended on behalf of the Kirkleatham Local Board that the basis of calculation should be merely the value of such mains, pipes, and fittings regarded as plant *in situ*, capable of earning a profit. The second contention was that the price must be ascertained by reference to the value of that which was parted with; but that it must be treated as the value to the seller and not the value to the buyer, and it was to be arrived at by the value of the revenue the Joint Board was able to earn by these mains and fittings. That was the rule adopted by the Arbitrator; and he confessed for some little time he was much impressed by the argument which seemed to be supported by what he thought to be the equity on behalf of the Joint Board. But, not without some little regret, he (Baron Pollock) had come to the conclusion that the Arbitrator's decision could not be supported under the terms of the Act of Parliament. The whole matter was entirely the creature of the Act of Parliament; and it must have exactly the same construction as any other Public or Private Act, although the position of the parties might no doubt assist one in construing it. The first duty of the Court was to look at what was the plain and clear language of the statute; and if they found that the same statute when dealing with one subject used one kind of language, and when dealing with another subject used another kind of language, it certainly was the duty of the Court to give effect to that which seemed to have been the intention of the Legislature in accordance with the language used. In the present case there were two things to accomplish. The very essence of the Act was to enable the two Corporations of Stockton and Middlesbrough to acquire the interest of the Water Company. They were to take over from the Company all its powers; and in section 15 the words were extremely clear. They were to require the Company to sell all their undertaking, property, rights, powers, and privileges, as the same existed at the time of the delivery of the notice; and they were to pay a sum for compulsory sale, and also for the prospective value of the Company's undertaking. This indicated as clearly as possible that the two Corporations were purchasing for the benefit of the residents within their ambits, and were to take over the whole concern and undertaking of the Company—its property, rights, powers, and privileges. The second object was this: There being many outlying districts—such as Kirkleatham— if it became desirable at any time (not necessarily immediately), such outlying districts must give a certain notice, and take over—not the undertaking or any portion of the undertaking, but they should be allowed to be unfettered, to destroy the monopoly as it existed, by providing water for their own district, and making such arrangements as might be necessary for the purpose. But then it would naturally come to pass that the mains, pipes, and other matters which belonged to the Joint Board, so far as that particular district was concerned, would become useless; and, on the other hand, the Local Board acquiring power to supply their own water would find a use for these mains and pipes. Accordingly, it was provided that the Joint Board should sell to such Sanitary Authority all mains, pipes, and fittings at a price to be fixed by arbitration; and after such sale, the Joint Board should cease to supply water within such district. This showed clearly that the supply was a matter provided for by Parliament, and was not to be dealt with by the arbitration. All the Arbitrator had to find was the proper price of the mains, pipes, and fittings used for the service; and he certainly had not to consider that there had been any sale of the undertaking, property, rights, powers, and privileges, as if it had been under section 15. He had no right to consider what the Corporation could earn by these pipes. They could only earn what the Legislature said they could earn; and this was limited by section 4, which enabled any outlying district to give notice and put an end to the power of supplying the district. Remembering the course the thing had taken before the Committee of the Houses of Parliament, he (Baron Pollock) did not see there was here any real hardship. It had been stated, in the course of the argument, that these pipes were being treated merely as so much old iron; but that was not the fact. The contention on the part of the buyers was that they should pay—not merely the value of the iron, but the value of that *plus* any cost of digging the ground, putting them *in situ*, engineering, surveying, and so on. The amount fixed by the Arbitrator on that basis was £8006; and it seemed to him (Baron Pollock) that this was the sum for which the award should be given.

Justice WILLIAMS delivered judgment to the same effect.

Sales of Gas Annuities and Shares.—At a sale by auction at Bolton last Thursday week, five lots, each consisting of six perpetual annuities of £1 1s. 5½d. connected with the *Bolton Corporation Gas Department* realized £160 per lot.——Twenty "A" shares in the *Camborne Water Company* were disposed of, at a public sale last Thursday, at prices ranging from £20 8s. to £22 11s. 6d.——At a sale by auction at Maidstone last Thursday, 130 £10 shares in the *Maidstone Water Company* realized from £16 to £17 10s. each.

The Gas Accounts of the Knaresborough Gas Undertaking.—The balance-sheet and accounts of the Gas Department of the Knaresborough Improvement Commissioners for the year ending March 25 last, have just been issued by the Gas Manager (Mr. W. Stansfield); and they show a very satisfactory result. The receipts on revenue account amounted to £2702; and the expenditure to £2459—leaving a balance of profit of £243. During the year, there has been a considerable outlay in additions and alterations, which have been charged to revenue. The gas made was 17,391,400 cubic feet; the average illuminating power being 18·31 candles. The price charged is 2s. 6d. per 1000 cucic feet, which is very low for such a small make.

* See p. 1078.

MISCELLANEOUS NEWS.

THE ROYAL COMMISSION ON LABOUR.

Monday, May 30.

(SECTION C.—*Present: The Right Hon.* A. J. MUNDELLA, M.P., *Chairman; the* DUKE OF DEVONSHIRE, *Mr.* M. AUSTIN, *Mr.* J. C. BOLTON, *Mr.* LEONARD COURTNEY, *Mr.* G. LIVESEY, *and Mr.* TAIT.)

The Evidence Relating to the Gas Industry.

In the JOURNAL for the 24th ult., the evidence so far given before the Commission was reported; and to-day the first witness called was a representative of the Coal Porters.

Mr. *C. Wheeler*, as representing the Beckton Coal Porters' Branch of the Gas Workers' Union, replying to Mr. MUNDELLA, said that although the coal porters had had disputes with The Gaslight and Coke Company, these had always been settled without strikes. The business of the coal porters was to unload ships from the North of England, and land the coals on the wharves of the Company.

Mr. MUNDELLA: What are your wages for that work?

Witness: I could not specify any wages whatever, because we are paid according to the amount of coal we have to unload. Sometimes we earn scarcely anything in a week, and at other times we earn a great deal. It is according to the weather and the season of the year. The number of hours and days that we work, depends entirely upon the arrival of the ships.

You cannot control the winds and the waves. In fine weather, I suppose the vessels arrive numbers together; and then in bad weather there are no arrivals?—At the present time we are earning scarcely anything; there are no arrivals whatever.

That is owing to the strike at the Durham collieries?—Yes.

How do you suggest that strikes should be avoided?—Speaking with an experience of 47 or 48 years, I never knew of a strike in my life but what arose through a misunderstanding between the employers of labour and the labourers themselves. There has always been a third party connected with the affair; so that the masters and the workmen could not get together to reason the matter over. We have had just as big a struggle, and as much trouble with The Gaslight and Coke Company as we have had anywhere else. But through the channel being open to Horseferry Road direct (from the labourers to the Directors themselves), we have settled our disputes without a strike; and the men and the masters are quite as comfortable to-day as they ever were. In the case of the firm of Burt, Boulton, and Haywood, who have the liquor from our works, directly the middleman was cleared out, the men got a rise of wages of 2d. an hour; and the Company have not only more work done, but it is more profitable.

Your contention is that, where masters and men are brought in direct contact with each other, a good understanding is easily arrived at; but you say there is a third party. Is he the sub-contractor?—What we term the "sweater."

Are sub-contractors employed now in connection with the coal porters?—No, we all share alike; each man has the money that he earns.

How was it then that, without sub-contractors, you were so near a strike?—It was for an advance of wages of a halfpenny per ton, which we obtained.

Have you any other suggestion to make for the prevention of strikes?—My suggestion is that Boards of Arbitration should be formed, composed of workmen and employers, which should meet at least once a month, and receive reports from various quarters as to anything likely to cause a disturbance, so that they could deal with it at once.

Have you ever had any practical experience of Boards of Conciliation and Arbitration?—No; we have never arrived at that yet.

Do you object to strikes as being disastrous to the workmen?—I think they are disastrous not only to the workmen, but, outside the workmen, to all concerned; and for that reason our Unions are formed on the basis of avoiding strikes if possible, and bringing about a better understanding between the workmen and their employers.

Do you speak authoritatively on this point?—I speak authoritatively from the men whom I represent, and the Union likewise.

Examination continued: The coal porters had at the present time a small grievance, which they would like to see remedied; and that was as regards the carrying capacity of the vessels that came with coals to the Beckton station. Although they had been fortunate enough to have only one accident through the breakage of machinery, it was built to suit vessels the largest of which was 1200 tons, whereas at the present day they had vessels carrying 2400 tons, which the cranes were too short to unload, and they wanted cranes on both sides. The suggestion which the coal porters put forward was that the Gas Company should build their own vessels and run them themselves for their own trade.

Mr. MUNDELLA: You want to make the Company the carriers of their own coal?

Witness: Yes. If the cranes were altered to fit the larger vessels, then they would not fit the smaller ones; and it would be a very great addition to the safety of the workmen if the coals were always brought in vessels of one size.

Mr. LIVESEY: You say that you have had no strike. Surely you did strike at the time of the Dock Strike?

Witness: No; we did not strike—we asked leave to suspend work for a week.

In sympathy with the dockers! You cannot deny that?—We stopped for an increase of wages; the coal porters had no Union at all then.

But they stopped in the first instance in sympathy with the dockers, and then a few days afterwards they said: "We won't go to work unless you give us an increase of wages." Was not that it?—Not as I understand it.

You say they came out because they demanded a halfpenny per ton extra all round. Did they not come out in the first instance in sympathy with the dockers?—Not to my knowledge.

What wages would coal porters get for unloading a 1200-ton steamer, which would take about ten hours?—They would earn about 16s. 8d. each for a day's work.

How often do you get that in a week?—Sometimes two days, and sometimes four or five days.

Do you not get on an average from four or five days every week?—Only in the winter time.

What do you get in the summer ordinarily?—About 30s. a week.

Only two boats a week?—That is all.

Do you remember in the case of a steamer called the *Black Diamond*, that the Seamen and Firemen's Union sent word to stop her, and the porters refused to unload her?—Yes; and we should do it again, because we contend that we are in the same branch of labour with the miners, and in that case the coals were scraped up by men whom we call "blacklegs."

Do you know that the strike at the Silkstone Colliery was brought about because the Miners' Union wanted to force the deputies into the Union; and the owners were not willing to have it?—Yes. I do not believe in forcing anyone into a Union.

Yet you would not allow any steamer to be unloaded by members of the Seamen's Union?—The same sort of men as brought the coal we should. They were not seamen; they were any men that they could pick up in the streets.

In December, 1890, the *Emerald* came from Sunderland, manned by a non-Union crew. If she had come to Beckton, would you have refused to unload her?—Perhaps, if she had come there, and the men behaved like other men, we should have unloaded her, and the men would have joined the Union by persuasion, as they did in another case.

Mr. MUNDELLA: You took up the cause of the miners of the North, not because it interfered with you and reduced your wages, or for anything that you knew at all about those men, except that you were told they were non-Unionists?—We were told that they were not sailors and firemen. But it would not be done again.

Why would it not be done again?—Because we have learned better.

You think you have done wrong?—We might have done wrong.

Examination continued: If it could be brought about, the coal porters would like work to cease at 4 o'clock on Saturdays; and they thought it would be reasonable at any rate not to start the unloading of a vessel after that hour on Saturday.

By Mr. TAIT: He was in favour of a legal eight-hour day on railways, in gas-works, chemical works, and so on; but it would be impossible to put it in force in the case of coal porters, because sometimes it would take less than eight hours to discharge a ship, and in other cases it might take twenty hours. He would like to see their trade restricted to 48 hours a week.

Mr. MUNDELLA: You want a legal eight hours day for other people, but you do not want it for yourself?

Witness: I should like it for myself; but it is impracticable.

Mr. *W. A. Valon*, President of the Incorporated Gas Institute, was the next witness. Having described the constitution and objects of that body, he said they had taken special steps for the collection of information to place before the Commission, in order that reliable information might be obtained with regard to the present state of the labour market in gas-works of the United Kingdom. With a view of obtaining statistical information which was not easily accessible, the Institute issued a series of queries to works carbonizing about 5000 tons of coal and upwards per annum, and making (about) 50,000,000 cubic feet of gas and upwards. These inquiries were issued in all to 170 gas undertakings in Great Britain, Ireland, and the Channel Islands, carbonizing altogether 4,380,090 tons of coal per annum. Returns were received from 110 of these works, carbonizing 2,886,501 tons of coal per annum; and of these returns the following synopsis had been prepared:—

SYNOPSIS OF RETURNS.

—	Forms Issued.		Forms Returned.		Forms Not Returned.	
	Number of Works.	Tons of Coal Carbonized Last Year.	Number of Works.	Tons of Coal Carbonized Last Year.	Number of Works.	Tons of Coal Carbonized Last Year.
England and Wales .	152	3,947,554	101	2,544,807	51	1,402,747
Scotland . .	11	286,702	7	236,693	4	50,009
Ireland . .	5	134,248	2	105,001	3	29,247
Channel Isles	2	11,586	—	—	2	11,586
Totals .	170	4,380,090	110	2,886,501	60	1,493,589

NUMBER OF MEN EMPLOYED.

—	In the 170 Works to which Forms were Issued (Partly Estimated).	In the 110 Works from which Forms were Returned (From Returns Furnished).	In the 50 Works Not Returning Forms (Estimated).
Yardmen . .	8,442	5,570	2,872
Mechanics . .	1,720	1,124	596
Stokers . . .	9,196	6,067	3,129
Firemen . .	1,099	749	350
Totals . .	20,457	13,510	6,947

YARDMEN AND LABOURERS.

The wages of yardmen and labourers ranged from 15s. to 26s. per week, as follows:—

In 39 works, pay lay between 15s. and 20s. per week.
" 48 " " " " 20s 3d. " 22s. "
" 16 " " " " 22s. 2d. " 24s. "
" 7 " " " " 24s. 9d. " 26s. "

The working hours ranged from 49½ hours to 72 hours per week, as follows:—

In 90 works the hours were between 49½ and 57½ per week.
" 18 " " " 58 " 60 "
" 1 " " were 61 "
" 1 " " " 72 "

Overtime was paid for as follows:—
In 61 works at the ordinary rate
„ 44 „ „ time and a quarter
„ 5 „ „ „ „ half

Sunday labour was paid for as follows:—
In 48 works at the ordinary rate
„ 20 „ „ time and a quarter
„ 34 „ „ „ „ half
„ 7 „ „ double time
„ 1 „ „ special terms

The percentage of increase in wages since 1887 was as follows:—

No. of Men.									
377	In	9	works	the	increase	was	under	5	per cent.
749	„	17	„	„	„	between	5	and	10 per cent.
1553	„	20	„	„	„	„	10	„	15 „
203	„	4	„	„	„	„	15	„	20 „
241	„	2	„	„	„	„	20	„	25 „
229	„	5	„	„	„	„	25	„	30 „
4	„	1	„	decrease was 9·8 per cent.					
1214	„	52	either no return or no increase						
4570		110							

MECHANICS AND ARTIZANS.

The wages of mechanics and artizans ranged from 22s. to 39s. 9d. per week, as follows:—

In	9	works,	pay	lay	between	22s.	and	25s. per week.
„	54	„	„	„	„	25s. 9d.	„	30s. „
„	31	„	„	„	„	30s. 6d.	„	35s. „
„	9	„	„	„	„	35s. 6d.	„	39s. 9d. „
„	7	no returns						

The working hours ranged from 49½ hours to 84 hours per week, as follows:—
In 82 works the hours were from 49½ to 57½ per week.
„ 16 „ „ „ 58 „ 60 „
„ 5 „ „ „ 61 „ 84 „
„ 7 no returns

Overtime was paid for as follows:—
In 65 works at the ordinary rate
„ 40 „ „ time and a quarter
„ 5 „ „ „ „ half

Sunday labour was paid for as follows:—
In 58 works at the ordinary rate
„ 15 „ „ time and a quarter
„ 30 „ „ „ „ half
„ 7 „ „ double time.

The percentage of increase in wages since 1887 ranged from 3 to 38·6 per cent.

No. of Men.									
256	In	11	works	the	increase	was	under	5	per cent.
322	„	26	„	„	„	between	5	and	under 10 per cent.
95	„	15	„	„	„	„	10	„	15 „
75	„	6	„	„	„	„	15	„	20 „
53	„	3	„	„	„	„	20	„	25 „
43	„	5	„	„	„	„	25	„	38·6 „
280	„	44	either no returns or no increase.						
1124		110							

STOKERS.

The wages of stokers ranged from 22s. 6d. to 44s. per week, as follows:—

In	1	works,	the	pay	was	22s. 6d.		per week.
„	7	„	pay	lay	between	25s. 6d.	and	28s. „
„	22	„	„	„	„	28s. 9d.	„	32s. „
„	36	„	„	„	„	32s. 6d.	„	35s. „
„	39	„	„	„	„	36s.	„	40s. „
„	4	„	„	„	„	40s.	„	44s. „
„	1	no return						

The working hours ranged from 48 hours to 90 hours per week, as follows:—
In 49 works the hours were from 48 to 58 per week.
„ 22 „ „ „ 62 „ 72 „
„ 31 „ „ „ 73½ „ 84 „
„ 1 „ „ „ 90 „
„ 7 No returns.

Sunday labour was paid for as follows:—
In 59 works at ordinary rate.
„ 11 „ „ time and a quarter
„ 2 „ „ „ „ third
„ 36 „ „ „ „ half
„ 2 „ „ double time.

Percentage of increase in wages since 1887 ranged from 3 to 50 per cent.

No. of Men.									
359	In	4	works	the	increase	was	under	5	per cent.
1090	„	20	„	„	„	between	5	and	under 10 per cent.
761	„	18	„	„	„	„	10	„	15 „
962	„	15	„	„	„	„	15	„	20 „
111	„	4	„	„	„	„	20	„	25 „
227	„	7	„	„	„	„	25	„	30 „
1074	„	9	„	„	„	„	30	„	35 „
99	„	2	„	„	„	„	35	„	40 „
84	„	3	„	„	„	„	40	„	45 „
716	„	6	„	„	„	„	45	„	50 „
584	„	22	either no returns or no increase						
6067		110							

FIREMEN.

The wages of firemen ranged from 25s. 8d. to 37s. 6d. per week, as follows:—

In	5	works,	pay	lay	between	25s. 8d.	and	30s. per week.
„	9	„	„	„	„	30s. 4d.	„	35s. „
„	3	„	„	„	„	36s.	„	37s. 6d. „

The working hours ranged from 48 hours to 90 hours per week, as follows:—
In 12 works the hours were from 48 to 57½ per week
„ 5 „ „ „ 60 „ 90 „

Sunday labour was paid for as follows:—
In 6 works at ordinary rate
„ 1 „ „ time and a quarter
„ 10 „ „ „ „ half

Percentage of increase in wages since 1887 ranged from 6 to 50 per cent.

No. of Men.									
155	In	3	works	the	increase	was	between	5	and under 10 per cent.
196	„	3	„	„	„	„	10	„	15 „
34	„	2	„	„	„	„	15	„	20 „
62	„	2	„	„	„	„	20	„	25 „
194	„	3	„	„	„	„	30	„	35 „
6	„	1	„	„	„	„	35	„	40 „
45	„	1	„	„	„	„	45	„	50 „
57	„	2	no returns						

The comparatively small number of firemen given in the returns was due, the witness remarked, to the fact that, in the generality of cases, the stokers acted as firemen. Efforts made to increase the number of returns met with no success; and it might therefore perhaps be fairly assumed that the works not complying with the request of the Institute in this respect were at present undisturbed by labour troubles, and were unwilling to run the risk of creating them by furnishing the particulars asked for. Sufficient information had, however, been collected to give a fair representation of the provincial gas industry.

Mr. MUNDELLA: In connection with the inquiries issued by your Institute, is there any special point to which you wish to draw attention?

Witness: In nearly every instance the company or corporation making the return, has not objected to the publication of the particulars themselves, but does object to the publication of the name of the town or works to which the particulars refer. In order, therefore, to respect such wishes, special reference to particular works has been divided, and the large amount of information supplied has been utilized in the formulation of merely general deductions.

In reference to the inquiry made by your Institute as to whether any system exists providing for conciliation, arbitration, sliding scales, or other means of preventing or arranging labour disputes, what was the nature of the replies received?—Amongst the 110 returns made, 25 replies were given to this query. In only one case was anything known of a Board of Conciliation in connection with gas-works; and that was a local effort which had not been called into action. In one case reference was made to a Local Trades Council having objects similar to those mentioned in the question; and in several replies reference was made to the Boards of Arbitration and Conciliation in connection with the iron and other trades.

What was the nature of the replies received to your question: "Can you suggest any means of avoiding or arranging labour disputes and promoting cordial relations between employers and employed in gas-works?"—Many of the replies merely referred to the desirability of creating sympathy between employers and employed, without specifying definitely the course to be pursued. In those cases wherein a specified course of action was mentioned, the most general suggestion was that Conciliation Boards should be formed, either locally or otherwise, on which employers and employed should be fairly represented. Other suggestions were made—such as payment by results, the adoption of some system of bonus or profit-sharing, like that practised at the South Metropolitan Gas Company, and the formation of a superannuation fund, to which employers and employed should equally contribute.

With respect to your inquiry, "Have you any system of holidays or other privileges to workmen, deferred pay, sick payment, pension, pecuniary assistance in case of accident, or other insurance fund?" what was the general nature of the replies?—To this query, the 110 returns contained 101 replies. In almost all works, holidays were given, ranging from three to ten days during the year, with payment during absence. In a large number of cases, assistance was given in case of accidents to men on duty, and during prolonged illness. Extra pay for Christmas Day and Good Friday was usual; as also the payment at the annual excursions of all expenses and loss of time. The returns showed considerable range with respect to holiday arrangements; some works being fairly liberal in this respect.

What do you gather from the replies received to the question, "Do you make deductions by fines or other forms of stoppage?"—It was answered in the negative by 85 works out of 110; showing that fines are the exception, and not the rule.

As to Sunday rest for men employed seven days to the week, what have you to say?—In most cases definite efforts seem to be made to reduce Sunday labour as much as possible. At the change of shifts, a spell of rest came to each of the stokers in turn—in some works on alternate Sundays; in others, on every third Sunday; and in others, at longer intervals. In the summer months, Sunday labour can be reduced to a minimum. Of the works making returns, three stopped from 6 a.m. to 6 p.m.; and two from 6 a.m. to 10 p.m. on Sundays; but none of the works seem to have the system of a seventh day rest, which is in operation at Ramsgate.

What was the nature of the replies received in response to your request for general remarks on strikes, or any subject of interest connected with the Labour Commission?—Several advocated legislation on the subject, with the more stringent application of punishment in cases of picketing or intimidation. Some suggested mutual forbearance, kindness, and firmness. Other recommendations were the formation of a Board of Arbitration and Conciliation, for which the Institute should be requested to furnish some members; agreements for long terms; combination amongst employers; profit-sharing and bonus granting; and facilities for the discussion of grievances by representatives of employers and employed.

Have you any personal views of your own which you would like to submit to us?—After carefully considering the information supplied by the returns, I am strengthened in my opinion that the weak point discoverable in most gas-works is the attempt to carry on continuous work, night and day, for seven days without rest. I recognize the difficulty of entirely stopping the manufacture of gas; and I do not agree with the system adopted in those works where a partial attempt is made to do so. My experience points to a different solution, by means of the plan adopted in the works under my charge at Ramsgate, where one day's rest in seven is secured for every person engaged.

Will you describe this plan?—Labour in gas-works may be classified under the headings continuous and non-continuous. Under "continuous" labour (working seven days per week) would be comprised stokers, firemen, coal wheelers, coke stackers, engine-drivers and their labourers,

valve-men, and various gangers and foremen superintending these men. Under "non-continuous" labour (working six days per week) would be comprised the officers and men employed in the outdoor department, artizans or mechanics and their labourers, and yard labourers. The "continuous" class are engaged in the carbonizing department proper; and they are those who cannot be relieved of duty without a personal substitute or a stoppage of the works. The "non-continuous" class are engaged on much the same work, and under similar conditions, as outside labour of corresponding nature. The method employed at Ramsgate for giving one complete day's rest in seven to all included under the "continuous" class, is by the introduction of personal substitutes. This necessarily requires the employment of one-seventh more men in the carbonizing department—that is to say, to allow of continuous work being carried on without any man working more than six days in seven, eight men must be retained instead of seven. This plan is worked by simply allowing a seventh of the stokers and other seven-day men to stand off in rotation for one day, whether employed on day or night work. Without modification, this plan would result in the man, whose relief came on Monday, always being relieved on Monday; and the man whose relief started on Tuesday, always being off duty on that day; and so on with the other men throughout the week. But, by a simple system of interchange, it is, at the Ramsgate works, so arranged that a free Sunday comes to every man in his turn, once in seven weeks—the free days in the interim falling consecutively from Monday to Saturday. I find that the system of giving a seventh day's rest does not increase the cost of carbonization. The men are physically and morally better; and they do their work more cheerfully, and with an enjoyment which men who work seven days right off cannot feel. Such men become jaded, downhearted, and weak; and the continuous work ages them prematurely.

Are you of opinion that it is necessary in gas-works that the work should be continuous?—It is impracticable to stop a works so as to give a clear 24 hours' rest on Sundays; and unless the men can stand off for 24 hours clear, the stoppage is of little practical use. The men who are changing to night duty have their Sundays spoilt by having to spend the greater part of the day in bed, in order to prepare themselves for the Sunday night's work. The extra labour and anxiety of having to start a "dead" works is so great as to lead, in my experience, to a request being made to the manager that work should be continued under the ordinary everyday routine.

You are aware that the advantages of Sunday rest to a working man is that his family are resting on that day as well as himself; and it is the day which he can spend with his family or with his fellow workmen, so that a day off on any other day of the week is not a satisfactory substitute?—That is the weak part of it. But, of course, his being at work does not interfere with the rest of his family.

Is there just the same amount of work on Sundays as on other days?—Just the same.

But you say every man has a day off one Sunday in seven?—Yes.

And your practical experience is that this is the best method of conducting gas-works?—I have thought it over in every direction; and I cannot see any other way out of it.

What do you mean when you speak of there being extra labour and anxiety in starting a "dead" works?—The men having stopped, we have to shut off certain valves and meters connected with the gasholders; and when they have to be started again, there is a great deal of anxiety, especially in winter-time, when the men have more or less to move about in the dark.

Mr. COURTNEY: Do the men work six days out of seven, or seven days out of eight?

Witness: Six days out of seven. The men have to change from night to day either once a week or once a month, according to the custom of the works; and it is arranged in such a way that they rest one day in seven.

Mr. MUNDELLA: As you have had a life-long experience of the gas industry, what do you say about the wages which are generally paid?—In my opinion the men are as well paid as in most manufactories—if not even better paid. There is now nothing very arduous in the work; the wear and tear on this score having to a large extent disappeared. Regenerator furnaces, by which the retorts are heated by gaseous fuel, have done away with the worst and most laborious work—namely, that of clinkering the fires; and stoking machinery has taken the place of heavy hand-scoops. Where machinery is not used, the heavy scoops formerly employed, which had to be lifted by selected men, have given place to lighter and more easily handled appliances. I am therefore of opinion that there is nothing in a gas-works that should justly cause dissatisfaction among the employees. Indeed, the reverse should be the case, as the same men are employed year after year, and in time have many privileges granted them, which are not accorded to ordinary workmen in other manufactories.

The hours are reduced and the wages increased?—Yes; and the heavy work in and about gas-works is done now by machinery, which makes the work much less arduous.

Is there anything dangerous or unhealthy about it?—Nothing at all.

Are there any vital statistics obtainable?—I do not know of any.

What is the general conduct and character of gas workers. In your experience, are they more temperate, for instance?—Yes. Thirty years ago it was sometimes painful to go into large retort-houses. At that time we employed a special class of men for lifting the very heavy scoops; and they were always full of beer. They took a large quantity of beer every chance they had; and we had a certain amount of trouble with them from time to time. Now we have reading-rooms on the works, where tea and coffee are supplied, and the men can have any amount of oatmeal they like to mix with water for the purpose of allaying their thirst. In all the works under my charge, we do not allow any drinking on the works; but we give ten minutes' interval in the morning, during which a man may smoke and do what he pleases—go into the lobby and make himself some tea or coffee—and the same in the afternoon. Since we have done this, we have found that the men are improving daily.

At about what age do they become incapacitated for work?—A man can work at stoking very well till he is about fifty years of age; and after that age, it has always been the custom at our works to provide other places for such men, so as to give them lighter work.

Have you any views on the matter of pensions or superannuations which you would wish to bring before us?—In my view, the question of old-age pensions can be more easily undertaken by gas companies than by any other manufacturing bodies. If gas companies and corporations were to combine and form a Central Association or fund, into which all employers contributed a fair and equal percentage of the amount received by the employed, no great difficulty would be found in providing pensions for old age for gas-works employees. I think profit-sharing, so far from preventing disputes, might lead to them.

Do you think it would be within the province of the Legislature to stipulate that all persons employed in gas-works, and all kindred works under statutory powers, should be provided with superannuation allowances?—No; I do not go so far as that. But I think some large central fund might be formed for the purpose. If it is only carried on in individual works, when a man left he would have to sever himself from the fund; whilst if there were a central fund, that would be impossible. At the present time the weak part of bonus or other systems is that they are confined to individual works—generally large ones. But if the principle was universally accepted or made compulsory in gas-works large and small, then the removal of a man from one works to another would not interfere with the amount of claim he would eventually have upon the general fund, which would from time to time receive a fixed percentage of the wages earned by the workman or officer as the case might be, together with an equal amount paid by the gas company or corporation. This would entitle a workman or officer, on attaining a given age, to receive a certain pension for the rest of his life, calculated according to the amount received for premiums. But whilst a person, on arriving at a certain age, might be legally entitled to this pension, it should by no means follow that he *must* retire on reaching this specified age.

Has it ever occurred to you that you might form a Joint Committee of Conciliation of employers and employed?—Yes, it has; and I think it a very desirable thing to be done. There is nothing in the world to prevent it.

Mr. LIVESEY: Your Institute does not now represent a single London Gas Company, and you have not had returns from them.

Witness: We left them out purposely, because we knew that you and Mr. Trewby were going to give evidence.

And you have left out Glasgow?—We had no return from Glasgow, or from Birmingham, or Liverpool, or Leicester.

Of the 110 gas-works from which you have had returns, the greater number work on Sundays the same as on ordinary days. Was it not your impression that Sunday work was stopped?—It was.

By your system, it costs nothing whatever to give the relief, does it?—I really do not find that it costs any more. We gain a little by not stopping the work.

But the other system, stopping on Sundays, does cost more?—Yes; there is a certain amount of waste fuel, and so on, which makes its cost more as between seven days' working and stopping, and seven days' working and not stopping.

You have said that the ordinary system in London is no relief to the night man. Would not the night man go on at 6 o'clock on Sunday morning?—He only gets relief alternately with the day man.

But the day man gets relieved?—A portion of the day-men obtain relief undoubtedly; but a large proportion of the engine drivers, firemen, and so on, do not.

Surely the drivers get off?—Only if you stop the engines.

Practically they get half their Sundays in the year. I myself find that the men are better and stronger; and I am sure they would not go back to the old system on any account. You do not seem to approve of profit-sharing?—I do not think I should like to put it in that way. I approve of profit-sharing; but I do not think it is the best way, and I think perhaps a better may be found. But I approve of it most distinctly as being a move in the right direction.

In giving a man wages, however high, you only buy his time; you do not purchase his interest in the concern, and it does not matter to him whether it is prosperous or not?—At the same time, if you give him a share in the profits, you are simply giving him a bonus in another form.

Is not profit-sharing something beyond wages? Does it not give a man an interest in the business which no mere wages would give him?—If he had some control of the way in which the profits were shared.

Supposing that a committee formed of representatives of both workmen and employers met in conference from time to time, to settle what should be the basis of profit, do you think that would be wages?—Yes, undoubtedly, because in that case you would import into the domain a question which had nothing to do with it.

Mr. AUSTIN: Did you engage one-seventh more men for the purpose of giving each man one day's rest in seven?

Witness: Yes.

Mr. BOLTON: Do you find the workmen unanimous in disputes as to hours of labour and wages?

Witness: No; I have found that that is not so.

In the case of Boards of Conciliation, would it be the majority that should rule the minority?—Yes, by all means.

Then how would the majority on the Board of Conciliation compel the minority?—They could not do that. They would be at liberty, of course, after the decision of the Board, to turn round and say, "We won't accept it."

Then what becomes of your compulsory powers?—In the first instance, you would start with a Board which is accepted by the men and the masters; and before the Board can get to work, they must agree to take the decision of the Board. If they did not do so, it would be a breach of faith.

Mr. MUNDELLA: You would rarely find that employers and employed did break away from the decision of the Board; and anyone who was recalcitrant would have public opinion against him, and would find it very difficult to maintain his position?

Witness: Quite so.

Mr. *Thomas Duxbury*, Engineer and Manager to the Darwen Corporation Gas-Works for the past 15 years, said the number of men employed at the works, in the depth of winter, was somewhere about 150. The number of tons of coals carbonized in the works last year

was 14,000; and the sum paid in wages amounted to £5500. From 1882 to 1887, when the works were pretty stationary, the average wages amounted to 2s. 9·4d. per ton, leaving out 1889, when they were in a transition state—changing the hours of labour from twelve to eight, &c.—and coming to the three years ending March, 1890, 1891, and 1892, the average cost per ton for retort-house work was 3s. 6·1d. The yardmen and labourers obtained from 20s. to 22s. per week, which he did not consider excessive. The stokers had 5s. 5d. a day, working eight-hour shifts, for carbonizing 3 tons of coal. They did not get as much work done in the eight-hour shifts as they used to do in twelve-hour shifts. Under the latter system, the cost of carbonizing a ton of coal used to be 2s. 0·64d.; whereas it was now 2s. 4·52d.—an increase of about one-sixth. The stokers, when working on Sundays, made £2 0s. 6d. per week; and this was more than the average wages paid in the neighbourhood. There was a strike in 1890; and the Corporation engaged new men, who for a time had to be kept under protection inside the works. This rendered the men on strike powerless; and they did not get the sympathy of the public or the support of the Union. The Union allowed them pay at the rate of 8s. per week for one week only. They afterwards applied to be taken back; but the Gas Committee refused to take them in a body, or to discharge any of the new men. Eventually, however, they consented to take them back as vacancies occurred, on the understanding that they would work side by side with the new hands, and not neglect work or interfere with them in any way. The men did not keep to their promise in this respect; and he had to take severe measures. One of the old hands, whom he had to discharge for interfering with the new men, told him he had instructions to do it from the Union officials. Witness thereupon decided that, when another case of the kind arose, he would discharge not only the immediate offender, but also the Secretary of the Union. Another case did occur within a few hours; and he then carried out his determination. This had the desired result; and he never had occasion to discharge another man. The state of affairs was such that he had to put his foot down in a manner that might have seemed harsh; but it was effectual. The grounds upon which the men struck in 1890 were, in his opinion, unreasonable. Having regard to their work and hours of labour, the Corporation men were far better paid than men employed in somewhat similar capacities in the surrounding factories. He objected to the demand of the Union that all men, without regard to their qualifications for work, should be paid at the same rate. The minimum standard fixed by a Trades Union ought to be for competent men, and incompetent men ought not to be entitled to the same rate.

The CHAIRMAN: But you are not bound to employ incompetent men?

Witness admitted that that was so; but he contended that it was hard on comparatively incompetent men that they should be debarred from getting employment for what they were worth. He was in favour of the establishment of Boards of Arbitration or Conciliation, to which either the men or the masters might appeal for the settlement of disputes. He thought such a Board might consist of a person nominated by the masters, another by the men, and a third by the Board of Trade. He considered that on public grounds strikes in gas-works should be prohibited during the four winter months; and, of course, there should be no reduction of wages or increase of hours during the same period. He would also like to see prohibition of picketing as carried out in his neighbourhood, where it often included a blow on the head.

The CHAIRMAN: But that is punishable very seriously.

Witness: I know it is; but they are not all punished.

That is not the fault of the law.—Perhaps not, if the law was strictly carried out; but I do not think it is.

By Mr. LIVESEY: The strike at Darwen took place because, after the hours had been reduced from twelve to eight, the men demanded increased wages. When they had been granted all they asked for in September, 1889, three months afterwards they presented fresh demands, which were refused. They did not then strike; but they did so in November, 1890.

Mr. TAIT: Do you wish to take away the legitimate right of picketing at present possessed by workmen?

Witness: I do not want to take away the legitimate power of picketing—only the intimidation and violence.

Mr. TAIT: I think you will find that the Trades Unions are with you in that, and as anxious as yourself to put down intimidation and violence.

Mr. *H. E. Jones*, Engineer and General Manager of the Commercial Gas Company, said they had never had any serious trouble with the men in their works; but they had had with the coal porters, who belong to a different Union. They had had a good many costly struggles over extremely unreasonable demands, which were not vindicated in any way by the men themselves or their Union leaders when discussing the matter afterwards. In two or three cases, the Union did not sustain the action of the men. In 1889, the coal porters stopped work simply in sympathy with the dockers; and, after being out for three weeks, would not resume work without extra money. They struck altogether, and without giving any notice. There was no arrangement with the coal porters that they should work exclusively for the Company, or that they should give a week's or a fortnight's notice before ceasing to work; but he thought some such notice might be reasonably expected from men who were working for a Gas Company almost regularly and continuously.

The CHAIRMAN: When you discharge them, do you give them any notice?

Witness: We do not discharge them. When they finish a ship, their job is at an end.

They are not considered as among the workmen employed as gas workers. From them you require notice?—Yes; a week's notice.

Why do you confine it to a week?—It is the custom; and we pay them weekly.

We understood the notice was a fortnight in some cases?—Yes. There was a notice introduced at the time of the alteration to the eight hours, when there was a good deal of trouble; but I disliked it so much that I did not carry it out.

If you are anxious to prevent the risk of your district being left in darkness, why not have longer notice—say, a fortnight or a month?—We pay the men weekly; and we think the law would require the notice to be the same.

You have to consider the exigencies of the public, as well as of the Company. Now there is a law specially made for you, which says, when a person employed by any gas or water contractors maliciously breaks his agreement, knowing that the probable effect will be to deprive the district of gas or water, he shall be liable, on conviction, to pay a penalty of £20, or three months' imprisonment. Surely that law was made expressly to prevent the public from suffering such consequences as the last witness indicated; and why do you not make your contracts with your workmen so as to give ample time, in case of dispute, for getting fresh hands?—Practically, we could get a fresh supply of men in seven days.

Then there is no such danger to the public as the last witness feared?—That is so, provided the men respect their notices; but I have known them throw down their tools, and refuse work for an hour or two, though it is true they have come back on being firmly treated.

Those have been cases of ebullition of temper, I suppose; but no serious breaking of notice?—No.

Therefore you can proceed in the ordinary way?—If they respect the law.

If they do not, there is three months' hard labour for them, is there not?—Yes; but it is very difficult to get three months' hard labour for 500 men. You might do it for five.

However, you think that practically the seven days' notice is sufficient?—Yes.

And you get no notice whatever from the coal porters; and when they struck in 1889, it was in sympathy with the dockers?—That is so.

What happened? Did you get them back?—Yes; and in coming back, they obtained extra rates of wages.

Witness proceeded to say, in answer to further questions, that the coal porters employed by the Company at the Regent's Canal were practically employed all the week through, as ships were constantly arriving. The men employed at Wapping averaged about three days a week; and when not employed there, they were generally at barge work for the Company at Stepney. There were gangs of them who worked at both places. Between the barge work at Stepney and the ship work at Wapping, they were engaged about 250 days in the year. At the conference which took place at the Mansion House, Mr. Michael Henry, for the coal porters, demanded that they should be paid the same for barge work as for shipping. Witness demurred to this, on the ground that the barge work was lighter, and less troublesome, being always done in the day time. But, at the urgent request of Sir John Lubbock, Cardinal Manning, and others, witness agreed to look into the matter if the gentlemen named would consent to act as arbitrators. Michael Henry then said: "But in the meantime we must have the extra money." The Company objected, but ultimately consented to pay the extra money pending the arbitration. Afterwards the men put difficulties in the way of arbitration, and nothing came of it; and it appeared that the arbitrators had not bound the men in any way to bring forward their case in a reasonable time. Sir John Lubbock wrote: "As the men were not prepared to submit their claims to arbitration, we have to regard the provisional reference to us as entirely at an end." The Company, however, had been paying the extra rate ever since. Witness himself was led into a kind of tangle over the matter. It appeared that the men employed knew nothing of the proceedings at the Mansion House; and, having once obtained the extra penny per ton, they said they intended to stick to it. In reference to the coal porters, he might add that the Company had had one or two cases of exceptional hardship to submit to, considering all they had done. In February, 1891, the men declined to unload a ship on the ground that the crew were not members of the Sailors' Union. Witness tried to reason with them, but failed to get them to act; and the Company had to pay £340 demurrage in consequence. In another case, they refused to unload because the ships were at a wharf where the regular men were on strike, and non-Unionists were employed. The Company had to remove the ships, and were put to expense. On Sept. 29, 1890, the men stopped in the middle of unloading a ship, and ordered the Company's weighers to withdraw. The foreman took the men away; and witness then stopped the unloading of the ship. They asked him why he did so; and he told them it was because they were not unloading it properly. They then said they would not, and demanded to be paid for what they had done. Witness refused to pay them. Ultimately they resumed work; and he sent the weighers back. He mentioned this and other instances to show the reckless way in which the Company were put to expense.

The CHAIRMAN: Have you ever tried to bring about a better understanding with the leaders of the Union?

Witness: I have been on what I may call good terms with the leaders all the way through; I have never taken up a line of hostility to the Union.

Have the leaders approved the kind of capricious action you have described on the part of the men?—Yes. The Secretary told me he was very sorry; but it was inevitable, and must be put up with.

Then it amounts to this, that the coal porters have refused to unload ships which have been manned by seamen who were not members of the Seamen's Union?—Yes, in two cases those are the kind of disputes that cost us most money.

And the coal porters have been put in motion by the leaders of the Seamen's Union?—I suppose so.

Are the relations better now?—The events I referred to are quite recent. The work of the coal porters has rather increased lately. As to the stokers, I have nothing important to speak of. The chief difficulty we have had has been caused by the men throwing down their tools, chiefly at night time, because of the employment of gangs of free labourers. This has occurred four or five times. In every case they were told that, if they would strike, they must—that they would be allowed to go, and that their places would be filled up. After some delay—three or four hours—they in each case went back. Our works are surrounded by the docks. The dock dispute came on after we had conceded the eight hours to our men. There was a certain amount of excitement when we reduced the hours. When the hours were altered, we did not lower the wages; but in some cases rather improved them. The

reduction of hours put us to great expense. In regard to wages, we ourselves felt that, as it was some years since they had had any great advance, some improvement in their position was desirable. They agreed to work at an increase of 28 per cent.; but the cost ultimately proved to be 48 per cent.

Have you increased the price of gas?—Yes, recently. This month we have been charging a small extra rate (2d. per 1000 cubic feet) in consequence of difficulties as to coals; the present price being 2s. 6d.

How is it there is such a great disparity in the prices charged for gas by different Companies in London?—That depends a good deal upon financial circumstances. The Companies are differently situated in regard to the amount of capital they have employed. Some of the older Companies have capital representing antiquated and costly plant, which has been replaced by much cheaper things. The younger Companies have had the advantage of smaller capital, and can consequently produce gas cheaper than the older Companies.

What percentage do you bring your shareholders?—An average of 6 per cent.

Ought not each Company to be able to produce gas as cheaply as the others?—No. They are not all equally well placed; some being on the river, and some on land. There is a difference, for instance, between our small works at Wapping on the river, and our large ones at Stepney.

Have you any suggestions to make as to any method that can be devised which will put an end to the friction between the Company and some of their workmen?—There has never been much friction, except when they obtained the eight hours, which they did very easily—much too easily. I am really opposed to it, although I am prepared to loyally abide by it now.

Do we understand that your cost of production is more than 40 per cent. higher than formerly?—Yes; the labour.

You do not mean that the men earn 40 per cent. more?—No; certainly not. The men work so much less. They get the same money for eight hours that they formerly had for eleven.

Has it ever occurred to you that the large Gas Companies of London might arrange a system of arbitration and conciliation between themselves and their workmen, and have a uniform rate of wages and hours of labour?—We do practically have a uniform rate of wages. As to a Board of Arbitration, unless it is very peculiarly constituted I have not much faith in it; and you must have the co-operation of the men.

But has it ever been submitted to the men that the employers are willing to enter into the establishment of a Board of Arbitration, at which all disputes might be discussed?—Yes. When we met at the Cannon Street Hotel, after the demands of the men had been conceded, I said to their delegates: "Would it not be better for us to meet in this way, and settle disputes?" and they agreed that it would. But I do not see what any Board of Conciliation can do, if one side or the other is determined to have every inch.

You have conceded the eight hours; and the other demands of the men?—Yes.

Examination continued: We work on Sundays to avoid injury to the retorts. But we try to suspend work for a clear twelve hours; and we pay double time for certain shifts. In regard to strikes, I am afraid you will never get rid of them. Of course, in an industry like ours, where the police safety of an important district depends on the light, we go into these disputes and negotiations with painful anxiety, knowing that any failure on our part involves great risk.

The CHAIRMAN: Do you think it would be wiser instead of having so short a notice as seven days that you should require and give fourteen days?

Witness: There might be some advantage in that, although I do not think seven days' notice is too short, if the men would respect it; and if you could really use the law of conspiracy. It is difficult to apply it to 3000 men.

You do not complain of the law not being severe enough?—No; but you have a practical difficulty, when you are dealing with thousands of men.

Your difficulty is that the men may break their contracts in masses?—Yes; that is the only difficulty. Apart from that, the seven days' notice would be sufficient. Of course, I should like fourteen days; but if we were to propose it, there would be fresh demands for terms.

You think men should be restrained from striking out of sympathy with another Union?—I think it ought to be provided against and punished. It puts me, for instance, who have no voice or power in the matter, in the position of having to suffer for the wrongful action of either masters or men in some other district altogether.

How can you prevent the collateral suffering to which you refer? Take the case of the Durham strike at the present time, numbers are suffering from the consequences who are not in the least responsible?—That, of course, is inevitable, when a strike goes to the fountain-head of the raw material. But it ought not to be inevitable that, because certain men are on a ship the miners should refuse to get coal, or other men refuse to unload.

But you know that you have a remedy in your own hands as gas-works proprietors if you employ your own coal porters, subject to notice?—I do not think that is quite a certain remedy, because you are assuming that, if a man is under agreement with you to work for a given time, he will never raise any of these questions. It is very difficult to prove malice.

By Mr. LIVESEY: The Mansion House conference was with the barge porters. Our barge porters are in our employ, and in regular work. The old rate gave them something like 12s.; and the new rate, 15s. They based their demand on the contention that the barge porters ought to have the same as ship porters. I was present when Michael Henry said: "I will accept arbitration for the other Companies, but not for the South Metropolitan; and unless it is agreed to, all the coaling shall be stopped to-morrow." It was under this threat that the Companies agreed. I received a telegram from you offering to unload for us; and I replied declining with thanks, because I was afraid of complications. I was afraid that, if we got the coals unloaded, our stokers would strike. I remember two strikes in London among the stokers—one in 1864, and another in 1872; and in both cases, the Companies procured men, and things were settled all right. When a workmen's Union goes beyond its functions, and assumes to govern one's works, it is better, however unpleasant it may be, to have a strike, and have it out, than to go on for a long time in suspense and uncertainty.

By Mr. AUSTIN: I would always prefer arbitration if I had confidence in the arbitrator, and was assured the men would abide by his decision.

(To be continued).

THE METROPOLITAN WATER SUPPLY COMMISSION.

Monday, May 30.

(*Lord* BALFOUR OF BURLEIGH, *Chairman; Sir* G. B. BRUCE, *Sir* A. GEIKIE, F.R.S., *Professor* DEWAR, F.R.S., *Mr.* G. H. HILL, M.Inst.C.E., *Mr.* J. MANSERGH, M.Inst.C.E., *and Dr.* W. OGLE, *Commissioners.*)

At the commencement of the proceedings this morning,

The CHAIRMAN announced that the Commissioners had decided to sit on Mondays and Tuesdays in each week throughout June, omitting Whit Monday and Tuesday.

Mr. *Corble*, Clerk to the Lea Conservancy Board, examined by the CHAIRMAN, said he had occupied his present position during the past 22 years, and was well acquainted with the district of the Conservators, five of whom represented riparian owners, one local authorities, two the New River Company, two the East London Water Company, one the Corporation of London, and one the London County Council. None of the landowners represented on the Board were officially connected with the Water Companies. The correspondence which took place in 1891 between the Board and the two Water Companies with regard to the navigation water arose in consequence of that having been a very short water time, and that traders were complaining to the Board of the want of water. The Conservancy then considered their rights, under the Act of 1855, as to passing more water down the river to fill up the lower reaches. The letters explained that water passed down the river would go out into the Thames, and be practically wasted. The other remedy was by dredging.

The CHAIRMAN: What quantity of water was being passed down the river prior to March 17, 1891?

Witness: The Engineer will be able to give the exact figures; but, taking it all round, except on one occasion, we never took much more than 1,500,000 gallons daily, though we are authorized to take 5,400,000 gallons, for navigation purposes.

For how long a time has your statutory quantity not been passed down?—For many years. A rough calculation shows that, if we took our full supply, it would be equal to 35 days' supply of the two Water Companies.

Do you mean you could not get it?—We could not get it without the two Companies losing that amount.

Have the 5,400,000 gallons a day been passed down since April 4 last year?—Only once during the summer—in June. We have never carried out our resolution strictly at any other time. The water in the lower reaches was then exceptionally low; and our Engineer acted on the resolution which gave him a free hand in any emergency.

One of the witnesses for the East London Water Company gave us to understand that, even if you did take this water, it would not make any material difference, because the reaches below were so wide that 5,400,000 gallons would not appreciably deepen the water over so large an area?—That is correct; but provision is made in the Act of 1855 for taking sufficient to fill up. If we did so, however, the Companies might make deductions from the water-rents.

You do not think that a very desirable consummation?—The Companies pay 3d. per 1000 gallons; and, worked out at that rate, they ought to pay us £250,000 a year.

Do you think that power will ever be put in force?—No. The Companies work very fairly with the Conservancy. Under the Lea Conservancy Act of 1868, they have to pay the Board £1000 per annum to be applied in preventing the pollution of the water—one-third being paid by the New River Company, and two-thirds by the East London Company.

That has very seldom been paid; and in one year it was only £96?—That was just after the Act was passed. In addition to this £1000, £3500 a year is paid for water-rents.

Examination continued: For the offence of turning sewage into the river, the Act imposed a penalty of £100 for the first day, and £50 for each day following; but the Conservancy had never been able to get a conviction under it. The magistrates naturally leaned a little in the circumstances, as the Board had to take the case to the town which was in question. In cases where manure was placed on the banks, they generally obtained convictions. They had had trouble from manure, lime, &c., carried on the river in barges; but there was no great amount of pollution from that source. In 1881, the trade in manure on the river was 46,913 tons; but last year it was only 28,972. More artificial manure was now carried by rail, though large quantities of gas lime were now conveyed along the river. He did not think the trade would increase. The main trouble was from the men pumping out the barges at night; but there was not a great deal of pollution from this, though, of course, it did tend to make the water in the river less pure than it otherwise would be.

By Sir A. GEIKIE: As to the steps taken to prevent this, the Board prosecuted the offenders when they caught them. With regard to the statement made by Mr. Bryan in his evidence, that the compensation reservoir formerly afforded an excellent means of flushing, but that the Conservancy's dredging operations had filled it up, he might say that the reservoir had no effect upon the lower reaches. All the water from it went to supply certain mills, and then passed out into the Thames. The mill rights were now abolished.

Major *Lamorock Flower*, Sanitary Engineer to the Lea Conservancy Board, examined by the CHAIRMAN, stated that he had filled his present position for 21 years. As to the question of pollution there was practically none above Hertford. They had had to take legal proceedings against the local authority of that town in reference to pollution; but they were not successful. There was undoubtedly a local pollution; and he did not think it ought to be allowed to continue. This

was 15 miles above the East London Company's intake; but he had seen the effluent lately, and it was black and offensive. The treatment of the sewage at Ware, near Rye House, was thoroughly efficient; and no pollution occurred there. The other sanitary authorities above the intake—Stanstead, Hoddesden, and Broxbourne—were satisfactorily disposing of their sewage by irrigation of the land; and the sewage of Waltham Abbey was now also well disposed of.

By Sir G. BRUCE: A considerable population existed above Broxbourne, which was not included in any sewage arrangements.

By Mr. HILL: Inspections along the river took place every few months; and sometimes at shorter intervals. No exact system was followed. The chemical witnesses would speak to the character and analyses of the effluents. The population above the East London intake was between 120,000 and 130,000, of which 80,000 would be in towns and villages.

By Dr. OGLE: None of the towns or villages passed their sewage into the stream, without previous treatment. In Luton millions of gallons of water were used daily in straw-bleaching by oxalic acid; but none of the water was passed back into the river. Possible sources of pollution to the number of 87 were shown on the plans above the East London intake. In his judgment, the character of the Lea water was not deteriorating year by year. At one time it was; but it was now improving. Whatever pollutions existed were gradually diminishing in character and effect. As far as manure was concerned, it was much less; and if an Act were passed to compel owners to make their barges sound, instead of allowing them to be leaky as they were now, it would be still further decreased. The quality of the water was good and wholesome; and the papers put in on behalf of the County Council did not fairly represent the condition of the water supply of the Lea Valley.

Mr. *J. Child*, Engineer to the Lea Conservancy Board, examined by the CHAIRMAN, confirmed his statement before the Rivers Pollution Committee, when dealing with this subject, that the smallest flow over Field's Weir had occurred in August, 1885, when it was only about 21,500,000 gallons a day. He also stated at that time that the East London Water Company were drawing from the Lea and reservoirs 23,171,190 gallons a day; and the New River and East London Companies together were taking the whole of the water in the river, except the quantity required for navigation. The smallest flow over the weir for six months of which there was any record was in the period from June to December, 1874; the average daily flow being only 15,300,000 gallons a day. It was pointed out to witness that it had been stated that the quoted gaugings were erroneously taken, and none given in the other witnesses' tables were so low; and he replied that the difference arose from the fact that the gaugings during the last nine years were taken on mistaken instructions. Those made before the year 1884 were correct.

By Mr. MANSERGH: They took 2,500,000 gallons a day; and an extra quantity beyond that for flushing purposes.

By the CHAIRMAN: The later gaugings in the tables showed no increase in the minimum flow in the dry months.

Mr. *W. C. Young*, Consulting Chemist to the Lea Conservancy Board, examined by the CHAIRMAN, said he had inspected the Lea annually, since his appointment nine years ago, throughout its course as far as Hertford, and twice up to its source. Those were official inspections or surveys made for the Conservators about July. His analyses did not indicate any serious pollution from sewage contamination. Traces of sewage appeared in the river, caused by the discharge of the effluent from the Hertford Sewage Works. The object of making the analyses was to contrast the condition of the water 100 yards above, and the same distance below, the point of discharge for the effluent. He found below that point an increased amount of albuminoid ammonia, free ammonia, and chlorine in the water. As a chemist, he did not think there was a process known by which soluble organic matter could be removed; and it was that which promoted the growth of fungus. At the source of the Lea, the quantity of organic pollution was half a grain per gallon. The analyses did not indicate any serious pollution by sewage matter in any part of the river, which was in a remarkably pure condition.

The CHAIRMAN: What do you say with regard to the water at the East London intake being fit for conversion into a fluid suitable for consumption?

Witness: It is very excellent water indeed, especially this year. In April last, the Lea water contained less than four-tenths of a grain of organic matter per gallon.

Was that after filtration, as supplied?—No, it was just after it was drawn in at the intake.

By Professor DEWAR: He introduced some figures to the notice of the Chemical Society in November, 1891, as to the organic matter in solution. Asked how his figures compared with Dr. Frankland's on the one hand and the Companies' officials on the other, witness said, if it were assumed that the organic matter in solution contained 23 per cent. of carbon, the same result would be obtained as given by Dr. Frankland. The figures submitted by the Water Companies, if multiplied by 4, should represent those given by Dr. Frankland, Dr. Tidy, and the other analysts. The percentage of nitrogen in the organic matter varied a good deal—from 21 to 28 per cent. He had only had a sample of one of the effluent waters submitted to him for analysis; and it was then very satisfactory. He should expect to find sewage fungus in all sewage-contaminated water; and this would become a further source of pollution if not removed. Dr. Brooks's and Dr. Odling's analyses showed the pollution to be more of an animal character than Dr. Frankland's.

Sir *W. H. Wyatt*, examined by the CHAIRMAN, said he had been Chairman of the West Middlesex Water Company for eight years, and a Director for fourteen years past; and he was also Governor of the Chelsea Water Company. The printed statement they had sent in to the Commission, gave a brief history of the Company down to the present time. By an agreement with the Thames Conservancy—to pay them £1000 per annum—they were allowed to draw 4,500,000 gallons of water daily from the river, in addition to the 20,000,000 gallons taken under the agreement with the City Corporation. The great point with regard to the Chelsea Company was that their district was very much built over—they were hedged in by the river itself, and by the other Water Companies; and they did not expect a large increase of population. There were only 528 acres of land which could be built upon in the district; and they calculated twelve houses to the acre. Assuming a certain quantity of water only was to be taken from the Thames, they were advised that there would be a surplus when the demands of all the Companies 15, 20, or 25 years hence were satisfied. There would be no difficulty in obtaining any quantity of water; and, in addition, there were wells and gravel beds, from which a considerable supply could be procured. Their present supply had had no effect upon the river. The water was kept at the required level by the lock below Hampton. The number of houses in the Company's district on March 31 last was 75,186, of which about 37,000 were under constant supply. The constant service was difficult to maintain in severe drought or frost; and enormous waste was caused by people tying up their fittings, and letting the water run so as to prevent freezing. Notwithstanding this, the Board thought it a wise policy to grant a constant supply as against an intermittent one; and the waste might be checked by more thorough inspection, to see that the fittings were kept in repair. In the older parts of the district, where the fittings were bad, they might exercise their power of cutting off the supply; but they did not care to do it. The proportion supplied for trade as against domestic purposes by the West Middlesex Company was 14 per cent.

By Mr. HILL: Their present consumption per head was 28 or 29 gallons a day, and was pretty steady—rather decreasing than increasing. A larger quantity of water would be required for a constant supply at first; but after a few years it might be different. He thought 28 gallons per head was an excessive quantity to allow.

By the CHAIRMAN: They would like to have a little more subsiding reservoir capacity; and they would have had it long ago, but were waiting to see what the turn of events would be before laying out money. He hoped the results of this Commission would afford them some light.

Mr. *M. W. Hervey*, the Engineer to the West Middlesex Company, examined by the CHAIRMAN, said their largest average pumping was in the week ending June 19, 1891, when it was 132,776,496 gallons, or a daily average of 18,968,071 gallons. They obtained these figures by taking the capacity of each pump, and the number of strokes made by the engines; 5 per cent. being sufficient allowance for errors from variations of stroke. His other figures were corrected from the census and quinquennial assessments. The inhabitants per house were 7·79—7¾ would be a fair basis to take. Having promised to send in a statement as to the annual supply by meter, witness proceeded to state that his Company could store 7¼ days' supply of unfiltered water; and they could easily pass through their filters in a day, one day's supply—16 million gallons—and a good deal more.

The CHAIRMAN: If your storeage reservoirs were depleted, and your subsidence reservoirs empty, and a long flood occurred, during which you would keep your intake shut, so as not to draw in flood water, how long would it be before you could hope to get the water you take in from the Thames in a fit state to be supplied for consumption?

Witness: We could pass it on to our filter-beds direct, and filter it at once. They would hold sufficient for the day's supply, at all events.

I understand you do not anticipate nearly so rapid a proportional increase in the next 40 years as you have had in the same past period.—No, we do not. In that time our number of supplies has nearly trebled. In 1873, there were 326 constant supplies; and in 1891, 32,342. In better class houses defective fittings were quickly repaired; but in such places as Lisson Grove, it was more difficult to get them done, notwithstanding constant inspection.

By Sir G. BRUCE: With regard to the engine power at Hampton, they had one compound Worthington engine at work, and two engines in reserve. Another triple-expansion engine was going to start work the next day. They could draw off the water in the filter-beds to within about 3 feet. It might be drawn right down; but they preferred not to do so, and, as a rule, they only drew it off to within about 6 feet from the bottom. A large quantity of water could be obtained during a great part of the year without taking any flood water at all.

By Mr. HILL: During actual flood time, they took as little water as possible. As to the arrangements for cleaning the reservoirs, they had cleared out one or two in his time; but they had gone many years before requiring it. He thought the last one went for 20 years. It had not been cleaned before. Then, taking the average of depth throughout the reservoir, he believed there were 15 inches of water in some places—near the intake it was deeper, and it gradually tailed off towards the end. With regard to future consumption, he thought it would be reduced per head.

By Mr. MANSERGH: The Company were now pumping at Hampton exclusively with the Worthington engine. The Cornish engine was ready for use, but they did not use it—it was a stand-by. They worked the Cornish engine at Hammersmith. He considered that 5 per cent. allowance was enough to cover short stroke and spill. As to their filling power, they had an area of 15 acres capable of dealing with 2½ gallons per square foot per hour. They were only pumping about 17,000,000 gallons; so that there was a large margin of filtering area. They never filled at the rate of 2½ gallons; but much slower. One filter-bed was generally out of use; and there might be another ready for cleaning. About five years ago, they removed, washed, and repaired the whole of the material in the first three filter-beds constructed for the Company in 1852. The total minimum thickness of filtering material was 3 ft. 6 in.; the sand being 2 ft. 6 in. With regard to the waste of water, he believed it was very largely due to defective fittings.

By Dr. OGLE: So far from there being any apparent waste from introducing the constant supply, the average daily supply per head had gone down almost coincident with that introduction. The constant supply began in 1873; and the supply per head was then larger than it had ever been before. The increase in the supply last year was due to the frost.

By Professor DEWAR: If the filters were not working properly, the analysis of the Company's chemist would indicate it. He did not think the filter-beds were cleaned because they absolutely required it; and he did not know that they afterwards filtered the water any better than before. The water unquestionably had improved by, he believed, something like 30 per cent. between 1868 and 1890.

By Mr. MANSERGH: He always shut off a bed for cleaning when it was filtering only at the rate of 2 inches per hour.

By the CHAIRMAN: If the level of the water at the Company's intake was reduced, it need not necessarily be so by the quantity of water abstracted by the Companies; but it might be due to manipulation at the weir.

Mr. *F. H. Wybroo*, the Secretary of the West Middlesex Company, examined by the CHAIRMAN, said there had been a very large increase in the number of supplies from 1880 to 1884. That was when the building speculation was at its height throughout London. Since then the increases had diminished in number very much every year, and were lower last year than at any time since 1876. It was thought that the increase in the future would not be so great as it had been during the last 40 years. The town district was almost entirely built upon; and only the country district, containing 5800 acres, remained to be built upon to the extent of about one-half during the next 40 years. This would only give an increase of 34,900 houses. Of course, this was only an estimate. The average population per house in the town district was 7·79; but in the country district, it was only 6·91. Therefore 7¾ for the whole future supply was rather an over-estimate.

Mr. *W. Willis*, Assoc.Inst.C.E., the Superintendent of Supplies of the West Middlesex Company, examined by the CHAIRMAN, said he had been 24 years in their service. In 1871 they were so anxious about the constant supply being introduced, that they took special steps through the turncocks to ascertain the amount of waste per day or week. In Lisson Grove they found waste occurring in perhaps every third or fourth house, and another similar place was Kensal Green New Town. On the other hand, in Hampstead Road or Stanley Gardens, they only found waste in every sixth house. They had lately increased their staff of inspectors; and by this means they would be able to reduce the daily quantity per head. Every gallon saved per head represented 500,000 gallons of water. Previous years they had got down to 25 gallons, in places where they made special efforts.

By Sir G. BRUCE: The Company's inspectors did not take leathers and washers with them for defective taps. They had thought over the matter; but did not know whether they would be able to work it.

Mr. MANSERGH: It is done sometimes in the country districts.

Witness: They find it saves something; but we find there are some fittings which are constantly out of repair. The defects as a rule are in the poorer class of houses.

Sir *W. H. Wyatt*, recalled, and examined by the CHAIRMAN, said the daily average supply of the Company was not quite so large in 1887 as in 1885. They attributed this to the exceptional circumstances in that year. In 1887, being Jubilee Year, the West-end of London was very full, and the weather was hot; but, of course, that would not account for 1885. In 1872 they delivered 301 gallons of water per supply; and the figures for 1891 brought out 279 gallons. This was due to greater activity in discovering waste. If the cisterns were not in order, they were not so soon emptied. They had made an allowance for empty houses in their calculations of gallons per head. They had treated them as if they did not exist, The number of houses cut off could be ascertained. If there was a considerable proportion of uninhabited houses, it might make a difference; but probably it would not be very large. In part of the district, the height of the houses had been much increased, and was still increasing. In Fulham, on the contrary, there was a large proportion of small houses. There were in the Company's district a great many houses let out in flats. The District Engineer would be able to give information on that point; but they were not bound to supply water beyond the height which their reservoir at Wimbledon would reach. The Chelsea Company thoroughly believed that under no circumstances could they ever be called upon to supply more than 15,000,000 gallons of water a day; and they were quite capable of doing that.

Tuesday, May 31.

Evidence on behalf of the Chelsea Water Company was continued to-day.

Mr. *Richard Hack*, the Engineer to the Company for the last six years, said that in 1872 the quantity of water they supplied worked out to 301 gallons per supply; and in 1891 to 279 gallons. The difference he attributed, in a measure, to waste through the condition of the engines. There was now a great improvement in the pumping, and not so much waste. The average daily supply was arrived at by taking as a basis his returns of the pumping. He estimated from the capacity of the pumps entirely; allowing no percentage for loss, because there was very little—5 per cent. would no doubt cover it.

The CHAIRMAN: One Company estimates 10 per cent. of waste?

Witness: It would be too much for my pumping.

Being requested to tell the Commission the considerations which applied to the estimate of the Company's future supply, witness said he must refer the Commissioners to the District Engineer for that. Being then questioned as to the subsiding reservoirs of the Company, he stated that they had four of these; and that they were all at use at one time. The water passed through all four. He next mentioned that on one occasion the Company had abstained for ten successive days from taking water from the Thames, on account of the discoloration of the water during flood. That was the longest period during which they had so abstained since he entered the service of the Company; but they had abstained for shorter periods—such as six and seven days. At present they had power to take 20,000,000 gallons out of the Thames every 24 hours. They now took less than half that quantity; but they were contemplating taking 15,000,000 gallons. They had spare land to extend their reservoirs and filter-beds.

Mr. HILL inquired if the Company at any time took flood water into their reservoirs.

Witness replied that he had never taken coloured water in; but he took it that there was very little harm in flood water coloured by suspended matter, such as clay. In the subsiding reservoirs, the water became clear; and they rarely had a filter blocked through a deposit. The depth of the reservoirs was 18 feet; and three years ago they were all four cleaned out. As a rule, they cleaned one each year—he was cleaning one this year.

What is the depth of the deposit at times?—Four inches. Five inches is the most I have found.

By Mr. MANSERGH: When we abstained from taking water from the Thames for ten days, we reduced the level of the water in the reservoirs by 10 feet.

By Professor DEWAR: We always filter at a constant rate. Irrespective of the quality of the water supplied to the filters, we filter at the same rate. But at all times the rate of filtration is very slow.

Replying to further questions, witness affirmed that his Company's water was of good and superior quality from one end of the year to the other; and this he thought was due to their storeage capacity and their extensive filtration area. He had had no complaints during the last few years as to the quality of the water supplied—with regard to suspended matter or discoloration. For the future, they were experimenting to have infiltration water—that was underground water—the same as the Southwark and Vauxhall and Grand Junction Companies had had for some time past. The experiments were being conducted on the Company's land at Moulsey, 100 feet from the margin of the river, and above its level. There was pure spring water there; and he did not anticipate any difficulties in procuring it. He did not anticipate having to go through an extensive operation of puddling to keep out sewage. Pollution from sewage could scarcely take place.

The CHAIRMAN: You are, as I understand it, limited in water to 22,000,000 gallons a-day—that is, 20,000,000 gallons by the old agreement with the Corporation of the City of London and 2,000,000 gallons by the new agreement which you concluded with the Thames Conservancy Board. Do you contemplate counting the water taken from the gravel bed as in the 22,000,000 gallons, or in excess of it?

Witness: In excess of it.

It is practically water which would go into the Thames if you did not take it?—Some of it would; I cannot say the whole of it. I am proposing to take this to enable me to prolong the time of the intakes being closed. I am going to take that water during such periods as the ten days I spoke of. During that I shall collect 3,000,000 gallons a-day, and add it to the reservoirs of clear water.

Supposing your intakes are closed for a period—you have said the maximum has been ten days—supposing they are closed for five days, that would mean (their being closed) that you would lose the chance of taking five days' supply from the river. Do you count that as lost to you for ever, or do you make up the supply when you get the chance?—Well, I have done; I have certainly taken more than the requirements of the Company after a flood, on different days when the water is clear. In view of another flood following up, I have filled up quickly; and then at such times, I take more water.

The point I want to get at is, do you consider that in the course of the year you are allowed to take 365 times 22,000,000 gallons, or is your agreement—your statutory power—that each day, from twelve to twelve, must stand or fall by itself?—Yes, each day of 24 hours we are limited to 22,000,000 gallons.

You see the bearing of this is that, if your intakes were closed and you were drawing water from the gravel (not taking it in from the river), you might have said, if you chose, that the 3,000,000 gallons were really counted in the 22,000,000 gallons that you are entitled to take?—Well, looking at it in that way, it might.

But if such a thing were to happen, and you were to hand over, as suggested, a portion of your unused limit of 22,000,000 gallons, you do not consider that you would be precluded from helping yourselves to this underground water by the fact of using in any particular way the whole supply that you are entitled to take from the Thames?—That is my contention.

Mr. HILL: What is the extent of this gravel area?

Witness: I do not know the extent of it. The depth of it is between 6 and 8 feet, all overlaying the bed of clay down the Thames Valley.

Is any large portion of this gravel area covered with population?—No very large area.

As to this particular area at Mousley, what becomes of the drainage from the population of that area? Does it go into cesspools, or is it carried away by a drainage system?—Carried away by a system of drainage.

Do you know that of your own knowledge?—I understand it is so.

The CHAIRMAN inquired concerning the distance of the Company's intake from Chertsey.

Witness stated that it was about 8 or 10 miles.

Is that from the district of the Chertsey Rural Sanitary Authority?—I believe from any part of Chertsey there would be a distance of 7 miles.

The CHAIRMAN explained that the reason he inquired was because the Chertsey Rural Sanitary Authority had sent a letter in which, after stating what they were doing to carry out their duties under the Public Health Act, they said that, until the populous places of their district were provided with sewers, it was impracticable to prevent a certain amount of pollution, from the overflow of cesspools or slop water from cottages, finding its way into the Thames; and that there were also wasting cesspools, some of them sending down to the water-beds from which London Water Companies drew part of their supplies. He wished to know if there was anything in these statements which suggested to the witness a danger to the gravel-bed of which he had been speaking,

Witness thought what the Chertsey Sanitary Authority spoke of was too far distant from his Company's gravel-bed to affect it. He should think there was nothing from Chertsey which could affect them at Moulsey.

(To be Continued.)

The Continental Union Gas Company, Limited, state that an interim dividend of 5 per cent. for the past half year on the ordinary and 3½ per cent. on the preference stocks will be payable on July 4, tax free.

The Proposed Purchase of the Taunton Electric Light Works by the Corporation.—The Taunton Electric Light Company last Thursday agreed to accept the offer of a Committee of the Town Council to purchase their works, subject to the approval of the Local Government Board and the Board of Trade, at the price of £9300.

THE ANNUAL REPORT OF THE CHIEF INSPECTOR UNDER THE ALKALI ACT.

The annual report to the Local Government Board of the Chief Inspector under the Alkali, &c., Works Regulation Act (Mr. A. E. Fletcher) was issued last week as a parliamentary paper; and, as in previous years, we extract therefrom the portions which have reference to matters with which our readers are most concerned.

The number of works registered under the Act does not vary much year by year; but last year it appears that it was less by 7 than in 1890. The alkali works proper are still in a decreasing minority as compared with other works which have been more recently brought under the Act. Of these there are 798, while of the former there are only 113. Counting with these the similar works in Scotland, brings up the total to 1048, of which 129 are alkali, and the remaining 919 other works. The treatment of ammoniacal liquor is carried on in the same number of works as in the preceding year—viz., 30; but there has been an increase of ten in the number of works carrying on the manufacture of sulphate and muriate of ammonia, the figures being 348 as against 338. During the year the Chief Inspector and his assistants paid 4793 visits to works, and made 4863 tests or partial analyses of the effluent gases. The Chief Inspector includes in his report a brief sketch of the prominent duties of Inspectors under the Act, and then he gives a table showing the average amount of acid gases escaping for each district. Referring to the column showing the acidity of chimneys (given as SO_3), which records an average of 0·700 grain per cubic foot, he says that the increase shown in the general acidity is doubtless in part due to the working of the Claus process in obtaining sulphur from sulphuretted hydrogen. In passing this gas, mixed with a limited quantity of air, through a layer of heated oxide of iron, the principal reaction which takes place is the oxidation of the hydrogen and the deposition of the sulphur. A secondary action, however, takes place simultaneously with this, reversing the primary action, whereby sulphur vapour with vapour of water forms sulphuretted hydrogen and sulphurous acid. The result is that a considerable quantity of these two gases passes away at the exit from the sulphur depositing chambers; and no efforts have yet been successful in completely effecting their mutual decomposition. Mr. Fletcher referred to this difficulty in his last annual report, and described some of the efforts that had been made to prevent the escape of these noxious gases into the air. As no decided success attended these efforts, he felt it his duty to insist that in any case the discharge into the atmosphere of sulphuretted hydrogen could not be permitted, even if recourse must be had to the unsatisfactory step of burning it. In so doing, an amount of sulphurous acid is generated, equivalent to the sulphuretted hydrogen burnt, and the result is the exchange of one most noxious gas for another less noxious—a process that can only be recommended as a makeshift until a better one is proposed. This method of dealing with these gases is at present in operation in all but two of the works; and the extra acid thus generated may account for the increased general acidity of the chimney gases. The problem of how economically to deal with the exit gases of the Claus sulphur kilns is, therefore, still unsolved; and the amount of sulphur lost is very large, reaching probably not less than 4000 tons a year.

The section of the report dealing with the manufacture of sulphate of ammonia opens with the following table, showing the amount produced in the United Kingdom during the past three years:—

	1891. Tons.	1890. Tons.	1889. Tons.
Gas-works	107,950	102,138	100,711
Iron-works	6,290	5,064	6,145
Shale-works	26,600	24,730	23,953
Coke and carbonizing works	2,766	2,325	2,795
Total	143,606	134,257	133,604

Considerable interest, Mr. Fletcher remarks, attaches to the gradual advance in these figures, as they show an increase of skill and care applied to many manufacturing processes. Almost the whole of the ammonia is collected during the distillation of coal; a small quantity being obtained during the distillation of bones and other animal matter. The "ammonia water" of gas-works, once considered as an entirely waste product—material that would not burn, and that was too offensive to be thrown away—now yields the principal supply. The distillation of shale for the production of paraffin oil ranks next; and this is followed by the blast-furnace gases of iron-works. The waste gases from these used not long ago to flare like beacons, lighting up the "black country" of Staffordshire and other districts devoted to the smelting of iron from its ores. Now these gases are brought down and burnt under the steam-boilers which supply power to drive the blast-engines of the works, also to heat the air being driven through the tuyeres into the smelting-furnaces. In so doing great inconvenience was experienced from the tar and liquor, which tended to clog the pipes, so that a system of definite condensing and collection of these matters had to be arranged. It was then found that this tar and ammonia had considerable value, and warranted the erection of large plant to collect them more completely. Great expense was incurred to this end. In one of the Scotch iron-works as much as 18 miles of 3-inch iron condensing-pipes are in use, together with mechanical scrubbers for separating the tar and ammonia from the gas before it is burnt. In some of the more extensive iron-works as large a capital as £70,000 has been expended in the erection of apparatus for the collection and manipulation of the tar and ammonia. To such an extent has this been found profitable, that there are cases where more of the capital invested in an iron-smelting works is devoted to the collection and treatment of the tar and ammonia than to the production of the iron itself, and more profit is yielded by the former than by the latter; so that it may be said that a strange inversion has taken place, and that in some cases iron has become the bye-product of an iron-smelting works, yielding the place of main product to the ammonia, &c. The following figures which Mr. Fletcher gives bear out this statement: Taking Scotland first. The number of blast-furnaces at present at work is 77. Of these, 57 are provided with condensing, scrubbing, and distilling apparatus for collecting the tar, ammonia, &c. He is informed that a blast-furnace of medium size costs, with its plant of blowing engines and the like, about £7800, and that the expenditure on the ammonia plant is in excess of this; so that in Scotland at present the apparatus for collecting the ammonia, tar, &c., from the gases of the iron blast-furnaces has cost over £444,600. A goodly sum, for collecting that which was formerly thrown away! And this must be on the increase, for if the outlay has proved remunerative when applied to 57 out of the 77 furnaces, one may expect the application to be still further extended. In England, the tar and ammonia are saved in only one of the iron-smelting works. It is there applied to the gas coming from three furnaces, at a cost of £12,000 per furnace, which is an expenditure greater than that incurred in Scotland. The resulting profit has fully justified the outlay. The sulphate of ammonia produced is probably quite sufficient to pay for interest on the capital expended, while the naphtha, oils, and pitch obtained from the tar bring up the profit account to a satisfactory figure. This process cannot be carried out with the blast-furnaces of the North-Eastern District of England, as in them coke is used. The tar and ammonia is driven off from the coal in the coke ovens, and must be collected from them if at all. In concluding this portion of the report, the Chief Inspector remarks: "It may be objected that, if the collection of ammonia were to be carried out much more extensively than at present, the price would decline, and the process become unprofitable. This fear will, however, vanish when it is remembered that the chief use for ammonia is agricultural. There is an unlimited demand for it as manure. In a previous report, I pointed to the fact that our farmers have as yet hardly realized its value to them in this respect, and that most of the sulphate of ammonia produced here is exported, much of it going to Germany. Regarded in this light, it will be seen that the demand for ammonia may gradually be very widely expanded, and any fall in price be at once checked by increased consumption."

In dealing with the tank waste of alkali works, Mr. Fletcher recalls to mind the description he gave in his report of 1888 of the Chance-Claus process then proposed as a practical method of dealing with this material, by which the sulphur was to be extracted and the residue left in a condition no longer liable to cause nuisance from the discharge of sulphuretted hydrogen into the air. It has now, he says, been largely applied, and has attained great commercial success with unusual rapidity. To say that the process is not perfect would be true, but ungenerous. It is the best hitherto proposed, and has already proved a great boon alike to the manufacturers and the public. Already 80,000 tons of sulphur have been extracted from the tank waste at a cost which leaves a profit to the manufacturer. The present rate of production is about 900 tons a week, and is fast increasing; the sulphur made being of the purest. This large production, he believes, has not brought down the price of sulphur—on the contrary, the price during the past year has been more than maintained; but the amount sent from Sicily has diminished. The recovered sulphur finds a ready market at home, and large quantities of it are exported to the United States and elsewhere. Mr. Fletcher also makes reference to the great combination formed in 1890 among nearly all the proprietors of alkali works, and says the anticipation that this consolidation would be fraught with benefit, from the point of view of an Inspector, has been fully borne out. Many of the smaller and less ably-managed works have been closed, the best managers have been promoted to the superintendence of a district, and the details of working, found beneficial in one place, have been carried out in others.

Passing over the reports upon other works which come under the cognizance of the Chief Inspector and his assistants, we notice that during the year there have been three cases in which a prosecution was instituted under the Act. Two of these were brought under section 11, on the ground of manufacturing operations having been carried on in works not previously registered as provided. In each case a penalty of £5 and costs was imposed. The remaining case was that of the Northwich Gas Company, for contravention of the provisions of section 9, in that sulphuretted hydrogen was allowed to escape into the air from the oxide purifier. A penalty of £10 and costs was imposed.

As the employees at some of the chemical works which come under the observation of the inspectors appeared to be protected from attacks of the influenza epidemic, Mr. Fletcher has collected a few statistics on the subject, as it appeared that useful information might in this way be afforded. It seems that very few of the cases recorded terminated fatally. Drawing a comparison between the men employed specially in connection with chemical work and those who were outside labourers or artizans, also those attending steam-boilers, he finds that the average proportion of cases among these latter classes is 16·35, while the average among the chemical workers is 9·08 per cent. The figures certainly show that chemical works are not centres of disease; but rather that they afford some protection from it to those employed there. This belief has for long been prevalent among the managers of chemical works. The manager of one gas-works writes: "I am sorry I cannot state the total number of men we have had down with the influenza, as no account has been kept. Neither of the men engaged at the sulphate of ammonia works has had it. Nearly every one of our outdoor men have been attacked; but the stokers in the retort-house have been singularly free, only one or two of them have had it. It seems to be most prevalent among those engaged out-of-doors in the fresh air." In a tabular statement which follows, it is shown that in gas-works employing collectively 3016 men, the total number of cases of influenza was 264; being at the rate of 8·75 per cent. Out of 590 men employed in sulphate of ammonia work, there were only 38 cases, or 6·44 per cent.; and of 1076 engaged in tar-works, only 56 were affected, or 5·20 per cent. The report concludes with these remarks: "The comparative immunity from attacks of influenza on the part of men employed in the manufacture of sulphate of ammonia has been noticed by many. In several works there was complete immunity. The average, as shown in the table, has been, however, brought up by one or two returns which tend to contradict this. In this manufacture there is liable to be a slight smell of sulphuretted hydrogen, and a peculiar odour arising from a substance present in the gas liquor. It would be interesting to know if this is the protecting agent. The

information here collected, as far as it goes, seems to show that men engaged in chemical manufactures are to some extent protected from attacks of influenza. Of these the men employed in alkali works, tar, gas, and sulphate of ammonia works appear to escape best. The inquiry is interesting, and might perhaps with advantage be extended to other branches of manufacture."

In an appendix to the report are given extracts from the reports furnished by District Inspectors. Some notice of these will be taken in a future issue.

MONTE VIDEO GAS COMPANY, LIMITED.

The Ordinary General Meeting of this Company was held last Tuesday, at the Cannon Street Hotel, E.C.—Mr. A. K. MACKINNON in the chair.

The SECRETARY (Mr. A. G. Hounsham) read the notice convening the meeting; and the report of the Directors and the statement of accounts (which were referred to in the JOURNAL last week) were taken as read.

The CHAIRMAN said that, when he had the honour of addressing the shareholders last year, and gave them a favourable report as to the position and prospects of the Company, coupled with the hope that the worst of the financial crisis in Uruquay had been seen, they little dreamt that in less than a couple of months after they would receive a severe awakening to disabuse their minds. It was not necessary to dwell at length on the subsequent events that took place, as they were familiar to the shareholders and others in this country. The facts that came to their knowledge would have prepared them to learn that the crisis in Uruguay was of a very acute character. As a consequence, strict retrenchment and economy became the order of the day, from the Government down to the poorest inhabitant—affecting materially the revenues of all companies and industries established there, their own Company suffering with the rest; and thus they were, unfortunately, unable to declare a higher dividend than 5 per cent. for the year. The shareholders had at previous meetings complained, and quite naturally so, at the smallness of a 6 per cent. dividend; and they might be disposed to ask why they should not now be paid an additional 1 per cent. (which, in fact, had been very nearly earned) out of the balance of £8027, which would be carried forward. To this he would reply that the Board, composed of prudent men, thought it desirable to have this balance in hand to deal with in case of contingencies; and he believed the shareholders would agree that in this matter the Directors had judged for the best in their interests. The number of public lamps now lit with gas exhibited an increase of 6·36 per cent. on 1890. This, while a hopeful sign, was coupled with a serious leakage of gas in the remainder of the lamps; for, at the request of the Municipality, they had to keep the connections intact. The Board trusted that this matter would have a favourable solution ere long. He might mention that, from data just to hand, they found, for the month of March of this year, the decrease in the consumption of gas, public and private, had been reduced to 8·44 per cent., which was an improvement. While on this topic, he could not resist uttering the hope that they might see their way, at no distant period, to make a reduction in the price of gas, to encourage a greater consumption, and meet the heavy competition of kerosene. At present, however, they were unable to foreshadow any proximate reduction, as they were handicapped by the heavy losses through non-payment by many consumers of their bills. Bearing on this subject, it was, he said, very gratifying to him to state that the Municipality for the past few years had been punctual with their payments. The Government departments had also for some time included the gas bill in their estimates; so that the Company obtained their payments with very fair regularity. Dealing with other interesting points, the Chairman said that up to the end of 1890, the Company had 85 miles of mains; and in 1891, they had been increased to close on 87 miles. The extensions had since been continued, as they would be in the future, so as to give the outlying districts the advantages of gas. Although the number of public lamps supplied with gas had increased during the present half year by 31, still they had only a total of 568 lamps. He was credibly informed that the public would be glad to see a return to the lighting of the remainder of the lamps by gas, for at present they were condemned to the light of incandescent glow lamps, which gave a light "small by degrees, and beautifully less;" whereas the illuminating power of the gas supplied averaged more than 17¼-candle power. The matter of coal supply had been an anxious one. Thanks, however, to good management, last year there was a decrease in cost of 7s. 6d. per ton carbonized; and he believed this year they might look forward to doing as well. The value of the stock of coal at December, 1891 was £3085 less than in 1890. The reserve fund remained at £70,000; and the insurance fund, at £11,500. They had £30,000 invested in first-class securities (in India, Metropolitan, and Nottingham Corporation 3 per cents., in equal proportions); and the balance was used as floating capital. The Chairman next made a lengthy explanation regarding the item of Government bonds, in the accounts; and, continuing, mentioned that the stock of gas-fittings for 1891 showed a decrease over the previous year of £234; of materials for use, £3866; and of materials for repairs to ships, £507. The decrease in the dock revenue of £1865 was not satisfactory. They had had few vessels in the dock for repairs; but the great depression in trade in Monte Video had operated against them. They could have taken larger ships had the dock admitted them; and although the Directors had been advised to enlarge it, they hesitated at the present moment to incur a considerable expense for an uncertain return. As he stated at the previous meeting, since their Manager (Mr. Lane) had been at Monte Video, the expenses had been reduced. As to the works, he was happy to say that the new plant and buildings were all but completed. Besides the new gasholder (making four in all at the works, and capable of storing close upon 500,000 cubic feet), these consisted of a number of coal-stores roofed, new condensers, engine and house, two boilers, double exhausters, station-meter and house, water-tank, pump-room, and two large purifiers. They would have to spend some additional capital on new works; but this outlay would be kept down until such time as the Directors saw a good prospect of an increase in the revenue to warrant it. Their Engineer (Mr. Anderson) had made changes in the retort-house, which would enable them to postpone the construction of a new one until such time as the increase of consumption would warrant the expenditure. With this return of prosperity, which he (the Chairman) trusted was not far distant, the shareholders might look forward to brighter prospects. He concluded by moving the adoption of the report and accounts.

Mr. MULVAM expressed the opinion that the report was not a satisfactory one. A dividend of only 5 per cent. was proposed; and the value of the shares had gone down 25 per cent. during the year. This, he thought, was not altogether owing to the financial crisis in Monte Video.

Mr. BARBER inquired whether anything had been done since the last meeting in the way of getting a deposit from the consumers, so as to prevent them running away without paying their gas accounts. The Company's great competitor appeared to be petroleum; and he was sure the consumers could not get three months' credit for that. They called themselves the Monte Video Gas Company; but it seemed to him they were also a dry dock company and a stock jobbing company. He believed they would find it far more to the interest of the undertaking if the Board curtailed some of these outside operations, and concentrated their attention on the original business of the Company; and then, instead of having a dividend of only 5 per cent., it would be nearer 8 or 10 per cent.

Mr. YOUNG remarked that he was not satisfied with the Directors' report, nor their recommendation that a dividend of 5 per cent. should be paid. He had been in the habit of regularly attending their meetings; but last year he did not do so, as the Chairman had, at the previous meeting, given the shareholders great hopes of better things. With a reserve fund of £70,000, and with stocks in hand representing altogether over £100,000, they were not earning what they ought to do. If they looked at other gas companies, they found they were paying respectable dividends. [Mr. R. MORTON: Those working on the River Plate, Sir?] He could not say that. But he held that reserve funds were for the purpose of equalizing dividends; and if they earned 6 per cent., especially in a time like the present, it certainly ought to go into the pockets of the shareholders. He should move as an amendment, that the report be received, and that the dividend for the year be at the rate of 6 per cent.

Mr. BYFIELD also expressed his dissatisfaction with the report and the dividend.

Mr. HUGHES asked if the Company were likely to get a renewal of the public lighting contract, and whether they would be opposed by the electric light.

Mr. MATTHEWS, in order to test the feeling of the shareholders, seconded the amendment. With their large reserve fund and investments, he could not see the object of only declaring a dividend of 5 per cent.; and he certainly thought the shareholders were entitled to the additional 1 per cent. Possibly, he added, the Company were in a better position to-day than ten years ago; but still the Chairman had stated in his remarks that, although the Municipality had not renewed the contract for public lighting, yet they compelled the Company to keep the mains charged with gas for the purpose, and this occasioned them great loss. What, he asked, could they expect in the future from a Municipality who treated them in this way?

The CHAIRMAN said, as had been truly remarked, the Board naturally knew more about the concern than the shareholders; and it was impossible for them to communicate every minute detail regarding the position of the Company. Their Company being a South American one, they had to deal with a condition of things which was wholly distinct to what ruled in England. Nearly the whole of his speech was intended for the other side. He wanted the Government to see that the Company were suffering from a wrong, in the hope that they would meet them, and remove it. As had been observed, they had really earned the extra 1 per cent.; and if it had not been for circumstances connected with the works, and that it was desirable to have an amount sufficient to meet their completion, without trenching on the reserve fund, the Directors would have paid the additional 1 per cent. dividend. One shareholder had expressed his opinion that they ought not to devote themselves to any other business but that of gas making. The reason they acquired the dock was that they might unload their coal expeditiously and economically; and, as it was considered a pity they could not utilize it in some other way, the shareholders agreed with the Directors to devote a small amount of capital to the purchase of machinery and for repairs, and this had since been earning very fair interest. The Company did not dabble in stocks. But "necessity has no law;" and as the Government owed them money, and were unable to pay, unless they took the bonds referred to, they would have fared very badly. However, he believed that in time the Company would not only get what they cost them, but something besides. As to the question of bad debts, they had succeeded in obtaining a deposit from some of the consumers; but they could not insist upon it in all cases.

Mr. ROBERT MORTON remarked that if the business had continued increasing in the way it was doing two-and-a-half years ago, the dividend, instead of being 5 per cent. on this occasion, would probably have been 10 per cent. But it had diminished to a large extent; and although they had curtailed the expenditure very considerably during the last two years, there were still some heavy expenses which must be maintained. While he did not find fault with the shareholders for wishing to get a higher dividend, and testing the feeling of the meeting as proposed, still he believed they would look at the matter in a fair way.

Mr. TATHAM said he thought it would be better if the question asked by Mr. Hughes in regard to the contract was put to the Chairman privately. Respecting the dividend, he pointed out that, although the Directors were proposing to carry £8027 to the current year's revenue account, they brought forward at the commencement of the past year £4034; and if they paid the suggested extra 1 per cent., they would only carry forward about £2000. Knowing the state of things in Monte Video, it was decidedly better to be prudent, and to make the dividend as secure as possible by keeping this £8027 in hand.

Mr. BARBER, after this explanation, appealed to Mr. Young to withdraw his amendment.

Mr. MATTHEWS, the seconder, said he should now withhold his support, as he had no doubt the collective wisdom of the Board was the best for the shareholders; and he should rely upon it.

Mr. YOUNG, after some further discussion, consented to withdraw the amendment; and the motion was then carried.

On the motion of the CHAIRMAN, seconded by Mr. SIMPSON ROSTRON, a dividend at the rate of 5 per cent. was declared.

The retiring Directors (Messrs. W. O. Dodgson and R. Morton) and the Auditors were next re-elected.

On the proposition of Mr. YOUNG, the usual complimentary vote was passed to the Chairman and Directors; and the proceedings then terminated.

GERMAN CONTINENTAL GAS COMPANY.

The Report and Accounts for 1891.

The following is an abstract translation of the report of the Directors of the above Company for the past year:—

The increase in the quantity of gas consumed from the thirteen stations of the Company amounted in 1891 to 1,850,092 cubic metres, or 5·53 per cent., as compared with 4·62 per cent. in the preceding year. As regards magnitude, this has only been surpassed in two years—1883 and 1884—when, on account of the cessation of certain contracts, an important lowering of the price of gas followed, and, as a result, there was an extraordinary augmentation in the consumption of gas. But in spite of this substantial increase, and although the lighting industry of the Company did not show any reason why the financial result should be less satisfactory than in the previous year, yet as regards the year just closed it can only be characterized as indifferent. In 1890, however, the low prices for coal ruling before the miners' strike continued until the middle of the year, and therefore the higher prices were only experienced during the second half; whereas throughout the whole of 1891 the Company's cost of production was burdened with excessively high rates for coal. A corresponding rise in the value of residual products could not be sustained, and even the preceding year's prices were not to be obtained; therefore a greater outlay for coal was confronted with smaller receipts for coke and tar. Moreover, the rouble exchange sank from an average of 235·5 in 1890 to 218 in 1891, which resulted in a considerable loss in the Warsaw undertakings of the Company. In addition to this, the repairs account at many large installations has been very heavy. On the other hand, neither the commercial aspect of the year 1891, which was generally bad, nor the continued extension of electric lighting in districts illuminated by the Company, has restrained the augmentation of the consumption of gas; and this is best demonstrated by the considerable increase in the number of new lights supplied during the last four years, amounting to an average of about 16,200 per annum. The Company have endeavoured, as far as possible, to meet this demand for fresh supplies of gas. *Inter alia*, the Directors have followed the example of the Paris Gas Company, and have laid on at the Company's expense service-pipes rising to the uppermost flats in both old and new houses, in order to supply sufficient gas for larger heating and cooking appliances and more extensive illumination, if required by their customers; the customers themselves having to pay the expenses incurred in making the connections from the rising pipe to their rooms. In Paris, this system has proved so successful in augmenting the consumption of gas and increasing the profits, that, up to Dec. 31, 1890, 30,230 of such conduits, gratuitously laid down, had been utilized by 110,496 paying consumers—a number which represents nearly half of the entire gas consumers of Paris. Moreover, the Directors instituted during the past year what are called "town inspectors," whose duty it is to look after the medium and smaller concerns of the Company; to test and improve the gas appliances (which are in many cases old-fashioned) in private dwellings; to introduce new burners and larger heating and cooking appliances; and to make known to the public the great progress of the gas industry during recent years. In order to assist the town inspectors in their duties, the Directors have had a small pamphlet prepared for their customers by one of the Engineers at the central office. In this is set forth in a popular manner the description of new apparatus, and the advantages of using gas for heating and cooking; supplying at the same time numerical examples derived from actual practice. This little pamphlet is distributed to the public.

In a previous report (March, 1890), the Directors drew attention to the progress made in the better utilization of gas, by the introduction of the regenerative lamps of Siemens and others, with which it was possible to obtain in large lamps double the illuminating power with the same quantity of gas previously required for the inferior illumination. After two years, they are now able to record a very important modification in the incandescent gas-burner of Dr. Auer von Welsbach, by which ordinary lights are improved to such an extent that, by using the newest refractory material, not only is the light effect of an ordinary flame increased fivefold without any greater consumption of gas, but also—a matter which is scarcely of less importance—with the newest burners the heat radiated is small. With gas at an average price of 16 pfennige, a light of 16 candles is obtained, with the latest type of Welsbach burner, at a cost of ½ pfennige (1-200th of a shilling) per jet per hour. In spite of this rapid progress in gas illumination, the Directors will also endeavour to supply the demand for electric light in the Company's districts by the erection of central stations in conjunction with their gas-works, but only when such demand appears likely to be permanent. The new gas-engines of 120-horse power installed at the Dessau central station last October, have proved a success.* The gas industry, therefore, is in a position, on the one hand, by operating conjointly with electricity, to permit of the latter being rationally supplied with the smallest expenditure for establishment and management; or, on the other hand, to successfully continue its competition with other modes of lighting, as is evident from the recent improvements.

* A full account of this installation was published in the JOURNAL on Jan. 5 and 12 last (pp. 21, 67).

The business records of the Company for 1891 show that the total production of gas—amounting to 35,298,364 cubic metres, with 337,586 lights—was distributed among their several stations in the manner indicated in the following table:—

Station.	Production in Cubic Metres.	Production compared with 1890.	Number of Lights.	Number of Lights compared with 1890.
Frankfort-on-the-Oder	1,936,220	+ 129,580	19,315	+ 334
Potsdam-Neuendorf	2,802,710	+ 325,978	28,598	+ 2,118
Dessau	1,744,810	+ 171,800	21,101	+ 1,579
Luckenwalde	773,216	+ 12,601	9,017	+ 414
M. Gladbach-Rheydt-Odenkirchen	4,829,690	+ 158,330	62,512	+ 2,765
Hagen-Herdecke-Haspe	863,640	− 165,670	9,258	− 319
Warschau-Praga	14,638,600	+ 749,080	111,760	+ 4,364
Erfurt	3,151,040	+ 369,586	25,926	+ 1,443
Nordhausen	1,018,982	+ 68,635	13,470	+ 700
Lemberg	1,231,910	+ 130,530	12,713	+ 1,757
Gotha	1,152,586	+ 107,892	15,326	+ 1,488
Ruhrort	936,680	− 213,220	7,991	+ 327
Herbesthal	218,280	+ 4,970	599	—
Total	35,298,364	+1,850,092	337,586	+ 16,970

The total gas consumption is accounted for in the following table:—

Purpose.	Cubic Metres.	Compared with 1890.	Percentage of Total Production.
Street lighting	6,217,679	+ 280,455	17·62
Public buildings	2,675,675	+ 178,924	7·58
Private consumption	12,972,383	+ 810,668	36·75
Consumed in factories	7,385,702	− 462,315	20·92
For heating	1,653,745	+ 292,400	4·69 } 10·61
For power	2,091,012	+ 250,629	5·92 }
Consumed by the Company	337,575	+ 27,647	1·01
Loss	1,944,593	+ 471,684	5·51
Total	35,298,364	+ 1,850,092	100·00

The length of mains amounted to 672,070 metres, as compared with 644,142 metres in the previous year. The average consumption of gas per burner for the past year was: For private lights, 85 cubic metres; for street lights, 455·3 cubic metres—average for all lights, 100·4 cubic metres. The numbers for 1890 were, respectively, 86, 448·6, and 101·4 cubic metres. The consumption for motive power of 2,091,012 cubic metres of gas was distributed among 527 engines, with 2179½-horse power. During the past year, the calculations and tests for the internal working of the Company were made by weight; and consequently the following numbers relate to kilogrammes only, and not, as heretofore, to hectolitres as well as kilogrammes. The average price of gas coal (Westphalian, English, Silesian, &c.) was 2·11 marks per 100 kilos., as compared with 2·06 marks during the preceding year. The yield of gas was 28·9 cubic metres per 100 kilos. The firing of the retorts consumed, on an average, 16·21 kilos. of coke and tar per 100 kilos. of coal carbonized. This is somewhat higher than the figures (15·39 kilos.) for the previous year, and is due to the use of new factors for the conversion of mass into weight, and the introduction of duplicate weighings—one in the store, and the other in the retort-house. Hence the difference arises from more careful supervision. The price of coke fell from an average of 2·33 to 2·23 marks per 100 kilos.; that of tar, from an average of 5·46 to 5·01 marks per 100 kilos. The price of ammonia continued to weaken, on account of the competition alluded to in the previous report; nevertheless, during the past year there was a slightly higher yield than in the previous year, owing to improvements introduced in the methods of working.

Turning to the statistics relating to the different stations of the Company, there was an increase in the quantity of gas produced, varying from 749,080 to 12,601 cubic metres, and in the number of lights, of from 4364 to 334, in all the stations except Herbesthal, Ruhrort, and Hagen-Herdecke-Haspe. At the last station there was a falling off of 165,670 cubic metres, or 16·09 per cent., in the production, and of 319, or 3·34 per cent., in the number of lights, due to the authorities of the Hagen Railway Station adopting electric lighting, and to their transferring to the municipal gas-works what gas business they still retained. The acquisition of new consumers at this station continued during the year; and it promises the best prospects in the near future. The retrogression at Ruhrort amounts to 213,220 cubic metres, or 18·54 per cent., in production; but there is an increase of 327, or 4·27 per cent., in the number of lights. The diminution is attributable to the Phœnix Smelting Works, the Company's largest consumer, introducing electric lighting. A prolongation of the arrangement with the town to December, 1914, gives a more certain prospect of recouping some of the deficit, by increasing the quantity of gas distributed to small consumers. At Herbesthal the production increased by 4970 cubic metres, or 2·33 per cent.; but the number of lights remained stationary at 599—a result to be anticipated, after the great increase in the previous year. At Frankfort-on-the-Oder the reconstruction of the entire system of purification taxed the capacity of the old plant to the greatest possible extent, and entailed an expenditure of 5700 marks from the renewal fund. The Potsdam-Neuendorf stations showed the greatest increase in gas consumption—325,978 cubic metres—that has been registered since its erection. In fact, the chief station in Potsdam has been completely overhauled and equipped up to the maximum capacity of the land. In order to gain space in a works situated at one extremity of the town, to facilitate the management, and more especially to aid the supervision and furnishing of installations, and to render intercourse with the Company's clients more convenient, the offices, installations, works, and the Manager's house are to be removed to a newly-purchased piece of land in the best part of the town. New contracts and prolongations of contracts lasting until 1920 were concluded in the outlying districts, Glienicke, Neuendorf, and Nowawes, which ensure for the future an extensive and developing market in the immediate vicinity of the two stations in Potsdam and Neuendorf. At Warschau-Praga, in spite of continued agricultural depression, an increase of 749,080 cubic metres in the gas consumption has been recorded, owing to the great activity of the management, and more especially to the

newly-organized town inspectorships at Dessau, the business continued to prosper. The electrical central station, as already remarked, had undergone reconstruction, and further economies had resulted from continued improvements, so that in the past year an average of 730 litres of gas was consumed per horse power, as compared with 750 litres in the previous year; consequently, although the electrical supply had increased by 482 ampère-hours, the quantity of gas burnt in the engines diminished by upwards of 8½ per cent. To run a glow lamp of 16 candles, including all accessories, required only a consumption of 91·38 litres of gas per hour by the engine, as compared with 100·52 litres in the preceding year. The working results for the year showed an increase of 482 ampère-hours in the production, 93 additional glow lamps, and an increment of 132 in the total lights reduced to 16-candle power. The number of arc lights remained unaltered at 59. The financial result was about the same as in the previous year; therefore debts and interest were covered. A better result can only be hoped for when the private consumption increases so as to equalize, to a certain extent, the exceptionally short periods during which the chief consumers (the Ducal Palace, the Court Theatre, and the Hereditary Prince's Palace) employ the light. Whatever the present result, the future advantage to be derived by the Company from this installation is regarded as good, inasmuch as by it they have shown the practicability of establishing electric light stations in medium-sized towns, under circumstances quite different from those obtaining in the numerous other systems of electric lighting. The central workshops will, in the Directors' opinion, develop into a big undertaking. The sale of apparatus continues to extend; and last year a large number of new and improved appliances were announced in a new catalogue, which can at once be turned to good account, not only in the Company's own stations, but also throughout the gas world. The building account of all the stations (gas-works, electrical central stations, and central workshops) was increased last year by 1,109,504·42 marks.

The profit and loss account of the Company for the past year shows a gross profit of 2,359,037·54 marks, or 197,544·88 marks less than in the previous year. A result of this character having been anticipated, a "compensation fund" of 200,000 marks was established in 1890, in order to allow for extreme variations in the prices of coal and residual products, more especially as higher rates for coal and losses on exchange might obtain simultaneously. This, in fact, happened during last year. The increase in the expenditure for coal, solely on account of higher prices, was 36,676·21 marks, while the reduction in the receipts for residual products amounted to 22,087·61 marks; and a loss is recorded through the fall in the rouble exchange, which brings the receipts 73,591·42 marks below the amount of the preceding year. In spite of this, the Directors, under the present circumstances, do not intend to draw on the "compensation fund," but to leave it at its present amount of 200,000 marks. They moreover intend to add 10 per cent. to the special reserve fund, but to reduce the renewal fund from 75,000 to 60,000 marks, as so much reconstruction and building has been done that it is not expected any beyond what the present reserve can cover will be carried out for some time. On this basis there would be carried over to the reserves: Special reserve fund, 184,279·14 marks; renewal fund, 60,000 marks—total, 244,279·14 marks. The total reserves (exclusive of the Lemberg sinking fund of 660,238·10 marks) would be: Reserve fund account, 1,500,000 marks; special reserve fund account, 900,879·35 marks; renewal account, 316,439·05 marks; compensation fund account, 200,000 marks; insurance account, 160,316·73 marks—total, 3,077,635·13 marks. Deducting the amounts stated from the net profit, the Directors proposed paying a dividend of 10 per cent. out of the balance, and carrying over 7056·57 marks to the new account.

The increase in the gas production during the month of January of the current year, as compared with the same month last year, amounts to 2·65 per cent., against 4·05 per cent. in 1890. The increase in the number of lamps, however, is 1387, against 631 in January, 1890.

In concluding their report, the Directors point out the need of more capital to carry on the ever-extending business of the Company, and to render possible the undertaking of any necessary enlargements, as well as the development of electric lighting. A resolution was therefore submitted to the general meeting, to the effect that the Directors should be empowered to issue bonds to the amount of 5,000,000 marks, and to arrange the terms and nature of the security, interest, and redemption thereof.

The Finances of the Stoke-upon-Trent Gas Department.—In the JOURNAL last week, we briefly recorded a further discussion in the Stoke-upon-Trent Town Council on the question of the accounts of the Gas Department. It will be remembered that Messrs. Alfred Lass, Wood, and Co., made a report on the subject, the accuracy of which was impugned by Mr. Sant, who stated the points on which he disagreed with it—one of them relating to the sinking fund. Since the meeting referred to, Messrs. Lass, Wood, and Co., have written a letter (which, we understand, was submitted at a meeting of the Council last Thursday) in which they say that the figures in their report with reference to the sinking fund are perfectly correct. They are based upon the figures settled by the Board of Trade in the Stoke Provisional Order, 1888; and, as fully explained when they had the pleasure of meeting the Committee, the Town Clerk, and the Engineer (Mr. H. Taplay), they could not go behind that Order. The figures in Mr. Sant's table differ from those in the Provisional Order to the extent of £1600, which constitutes the whole difference between Mr. Sant's figures and Messrs. Lass and Co.'s. It will also be observed, they remark, that credit was given by them to the sinking fund for the full amount of the repayments shown in the published accounts of the Committee for the year ended March 31, 1891—viz., £4217 13s. 6d. They had not the books to refer to at the time of writing; but, as far as their memory served them, they believed it would be found that the £1600 was paid off very shortly after it had been borrowed; and the Board of Trade no doubt took this into consideration when they settled the figure given in the Provisional Order as £41,900, instead of Mr. Sant's figure of £43,500. If it is desired that the £41,900 mentioned in the Provisional Order of 1888 should be altered for the purpose of making it agree with Mr. Sant's table, it appears to Messrs. Lass and Co. that application will have to be made for another Order.

THE KIRKLEATHAM WATER-MAINS ARBITRATION.

The brief paragraph, with the above heading, in our issue of the 24th ult., p. 982, is likely to be misunderstood, it has been pointed out to us, unless an explanation of the matter is given. The Arbitrator (Mr. Henry Law) has certainly restated his award, and given the method he adopted in framing it; stating that, in his view, his basis was "the correct one," "having regard to the whole scheme of the Act of 1876." He, however, gives an "alternative" award to be used if the Court should be of opinion that he was wrong in his original method.

To make the matter absolutely clear, we quote the re-statement of Mr. Law's award, which was in the following words: At the hearing of the reference, two rival contentions were put before me as to the principle upon which the price of the "mains, pipes, and fittings" under the Act ought to be ascertained. It was contended, on behalf of the Kirkleatham Local Board, that the basis of calculation should be merely the value of the mains, pipes, and fittings regarded as plant *in situ* capable of earning a profit; and this value they arrived at by taking the cost of the mains, pipes, and fittings, of laying them down and making good the ground, and deducting a sum for depreciation. They further contended that I had no jurisdiction to take into consideration at all the present or prospective earnings of the mains, pipes, or fittings. On the other hand, it was contended, on behalf of the Joint Board, that the price must be ascertained by reference to the value of that which was parted with; but that that value must be taken as the value to the seller, and not the value to the buyer, and that as the sale of the mains, pipes, and fittings in question was coupled with an obligation on the part of the Joint Board to cease to supply water within the Kirkleatham district, what the Joint Board were really parting with was their power of earning revenue by the supply of water through the mains, pipes, and fittings in question in the Kirkleatham district, and that at all events, the value to them of the mains, pipes, and fittings in question was to be measured, not by the cost of providing them and laying them down or by their mere value as plant *in situ*, but by the revenue which the Joint Board was enabled to earn by their means. Having regard to the whole scheme of the Act of 1876, it seemed to me that the contention of the Joint Board was the correct one; and I, therefore, adopted the following basis in arriving at my award: I capitalized the average net revenue earned by the Joint Board in the Kirkleatham district for the seven years ending the 13th of August, 1891, made all proper deductions for working expenses, maintenance, rates, &c., and further deducted the Kirkleatham district's proportion of the revenue earning part of the Stockton and Middlesbrough water undertaking in 1891, less certain deductions; and the result was the figure which I previously awarded—viz., £25,424. In arriving at this sum, I did not take into consideration, nor does such sum include, any amount in respect of any prospective increase in the revenue earned by the Joint Board in the Kirkleatham District. If the Court should be of opinion that I was wrong in adopting the basis of calculation aforesaid, and that the basis contended for by the Kirkleatham Local Board should have been adopted, then I award, in the alternative, that the price of the mains, pipes, and fittings, calculated upon such basis, is the price or sum of £8006.

As reported in our "Legal Intelligence" to-day, the Queen's Bench Divisional Court has held that Mr. Law's original award was wrong, and adopts his latter amount of £8006 as the value to be paid by Kirkleatham.

THE REGULATION OF WATER COMPANIES' POWERS.

In our "Parliamentary Intelligence" to-day, we report further proceedings on the above-named Bill, which has been somewhat modified since its introduction. In its original shape, it consisted of a preamble and 14 clauses, whereas now there are 17 clauses. The following is an epitome of the Bill as finally amended:—

The preamble sets forth that it is expedient to amend the Water-Works Clauses Act, 1847. By clause 1, the title of the amending Act is to be The Water Companies (Regulation of Powers) Act, 1892; and clause 2 specifies that it is not to apply to Scotland or Ireland. Clause 3 gives a definition of a water company. Clause 4 provides that companies are to serve on consumers a demand-note for water-rate, giving particulars in regard to their claim. It is to set forth the rental, annual value, or other basis at or upon which the premises in respect whereof the claim is made are assessed, as well as the scale, percentage, or prescribed sum claimed; and the company are not, until the service of the note, to enforce payment of the water-rate. Clause 5 specifies that every demand-note, except when the water is supplied solely under agreement or by meter, is to have printed upon it a statement informing the person liable to the payment of the water-rate that unless he shall give to the company, within 14 days from the day of service, notice objecting to the amount claimed, he will be held to have admitted his liability to pay it. According to clause 6, the times at which the demand-note shall contain or be accompanied by the statement of particulars already referred to shall be as follows: (1) Where the annual sum on which the premises supplied are chargeable for the purposes of water-rate exceeds £20, quarterly when payment of the rate is claimed quarterly, and half yearly when it is claimed half yearly. (2) Where the annual sum does not exceed £20, once within three months after the commencement of the Act, when the person liable to the payment of the rate shall first become entitled to a supply, and when any alteration shall be made in the last previously given statement of particulars. (3) Where the rate is for water supplied under agreement or by meter, at any time after the company shall be entitled to require payment thereof. By clause 7, where the annual sum on which the premises served are chargeable for water-rate does not exceed £20, every demand-note which shall not contain or be accompanied by particulars, shall have printed on the face of it the following words: "The particulars of the amount hereby required to be paid will be again furnished on application in writing being made at the office of

the company by or on behalf of the person liable to pay the same." By clauses 8 and 9 notice is to be given to the company if fresh particulars are required on any change of person liable; and objections to the demand-note are to be made within 14 days. The notice is to specify the items and particulars in question, and the grounds on which they are objected to. Where no notice of objection has been given, the amount claimed shall, for the purposes of the Act, be deemed to be admitted. Clause 10 specifies that no occupier indebted to a water company in any amount due shall, until he has paid it, be entitled to demand from the company a supply of water for any other premises. According to clause 11, where the occupier is liable to the payment of the water-rate in respect of any premises, no water company shall cut off the supply for non-payment of any amount in dispute until it has been settled by a Court of Summary Jurisdiction in the district in which the premises are situated, nor for non-payment of any rate until the expiration of 14 days after notice in writing has been given by the company to the occupier of their intention to cut off the supply. No notice is to be given by them until the expiration of 14 days from the service of the demand-note for the non-payment whereof the supply is to be cut off. When any notice has been given, the occupier may, before the expiration of 14 days after service, apply to a Court of Summary Jurisdiction; and the Court may require the company to postpone the cutting off of the supply for such time and on such terms and conditions as may seem fit. It is provided, however, that the application shall not be based on an objection taken to, or to the payment of any admitted amount, or any amount decided to be due. If, within 14 days from the service of the notice, the amount shall not have been paid, and if such application for delay shall not have been made by the occupier, or if made shall have been refused, the company may cut off the supply in any case in which the occupier is liable to the payment of the water-rate. Clause 12 gives a water company power of entry in certain cases; and clause 13 specifies that they are to be liable to a penalty not exceeding £5 per day on cutting off a supply in contravention of the Act. By clause 14, notice is to be given to the Sanitary Authority of the supply being cut off; and any company failing in this respect are to be liable to a fine not exceeding £10; and the Sanitary Authority are to take proceedings. By clause 15, the powers of the Court of Summary Jurisdiction are defined. Clause 16 specifies that the Act is not (except as regards certain of its clauses) to apply where water is used solely for trade, business, or manufacture, or for ornamental purposes, nor where it is supplied partly for trade, business, or manufacture, or for ornamental purposes, and partly for domestic purposes, if the amount of the water-rate stated in the demand-note in respect of the supply for domestic uses is less than that of the water-rate so stated for the other purposes, or any of them. The date for the commencement of the Act is fixed by clause 17 at Dec. 25, 1892.

A Town thrown into Darkness.—About 9 p.m. on Saturday, the 28th ult., the gasholder at the works of the Market Rasen New Lighting Company failed to act, and without any warning all the shops were thrown into darkness. In most instances the tradesmen were compelled to resort to the use of candles. The supply was resumed early the following morning.

The Extensions at the Leeds Gas-Works.—In moving the confirmation of the proceedings of the Gas Committee at the meeting of the Leeds County Council last Wednesday, Alderman Gilston pointed out that they had accepted a tender from Messrs. W. Nicholson and Son for the erection of an exhauster and boiler house and chimney at the Meadow Lane works, for £1715; and also a tender from Messrs. Clayton, Son, and Co., for the erection of a gasholder near the works, with a capacity of 5,250,000 cubic feet, for £34,790. The highest tender, he added, was £61,000. The minutes were approved.

Horton's Estate, Limited, is the title of a Company registered with a capital of £500,000 in £100 shares, to adopt an agreement come to between members of the Horton family of Birmingham, Finbury, and Malden. The objects of the Company are very various. Among others, to deal in house, land, or other property, and in freehold and leasehold ground rents; to make advances thereon; to act as builders and contractors; to establish and maintain water-works, gas-works, hotels, and places of amusement; to trade as brick makers, timber merchants, carriers, &c., also as stock and share dealers, company promoters, and carry on the general business of a financial agency.

Staffordshire Potteries Water-Works Company.—The annual meeting of this Company was held at Hanley last Wednesday week. The Directors reported an increased rental of £503. The balance for the year, with the addition of £2264 brought forward from the previous accounts, made a total of £19,029, from which, after deducting the interim dividend of 3 per cent. paid in December, there remained a balance of £10,629. Out of this, they recommended a dividend of 3 per cent. for the half year ended March 25 last, free of income-tax; making, with the interim dividend, 6 per cent. for the year, and leaving a balance of £2229 to be carried forward to next year's account. The new works at Hatton were approaching completion, and the permanent engine was now delivering water into the Hanchurch reservoir for distribution to the district; and the supply obtained from that source, together with that from the existing works, would enable the Company to meet all demands for some considerable time. In moving the adoption of the report, the Chairman (Mr. J. F. Wileman) congratulated the shareholders upon possessing a sound and prosperous undertaking. This year, he said, they were paying £329 in interest on debentures and £2100 on new stock more than was paid three years ago; and they were doing this without materially reducing the credit balance. Their revenue advanced steadily; last year's increase being £503. It was true they would have to provide more dividends on the new stock which they lately sold so satisfactorily at a premium of 53 per cent.; but they did not anticipate any great difficulty in meeting this increased demand. With this last issue of new stock, the Directors hoped and believed that they had touched the bottom with regard to expenditure upon new works. The motion was carried; and it was also resolved that the remuneration of the twelve Directors be increased from £500 to £750 a year.

NOTES FROM SCOTLAND.

From Our Own Correspondent.

Saturday.

A meeting of the Edinburgh and Leith Gas Commission was held on Monday last, at which the business was not of surpassing interest. The Engineers presented reports, which showed that by the agreements which have been effected with the Railway Companies, concerning the rates to be charged for the carriage of goods to and from the works, a saving of £3721 a year has been effected, as compared with the maximum charges which were proposed by the Companies. As the Railway Companies have not, however, been in the habit of charging maximum rates, and it is improbable they will do so in future, the saving will be greater than is represented by the above-named sum. The principal item of business before the Commissioners was the report upon the gas supply by the Edinburgh Merchants' Association, which was submitted by the Secretary of the Association in a courteous letter, backed up, however, with a rather forcibly expressed hope that the Commissioners would be able to adopt the suggestions made. The Lord Provost welcomed the report, as showing that an influential body of citizens were interesting themselves in their doings; and he expressed his belief that the illuminating power of the gas they supplied was ridiculously high. It was not suitable for use as a motive power. If they were to make a change now, they would feel that they had support in the community; but before doing so, they would require investigation as to how they would be situated with respect to their works, their pipes, and the burners in use. He thought they should ask their men of skill to report to them upon these matters. Mr. Kinloch Anderson, in moving that the report be sent to the Works Committee, expressed the opinion that if they reduced the illuminating power of the gas, they might have the consumption increased by 50 per cent.; and he doubted whether the consumers' bills would be any lower. Bailie Archibald pointed out, with reference to the complaint in the report that coal-owners made too large a profit upon the coal they supplied to the Commissioners under yearly contracts, that the Commissioners in the first year of their existence, realized a profit of from £15,000 to £20,000 by coal being cheap, and said that they must naturally take the bad years with the good in that matter. He suggested that they might make an experiment in the autumn with a lower quality of gas, to see how the public would take to it. Several other speakers approved of the proposal to lower the illuminating power of the gas. Mr. Wells recalled the fact that two years ago he proposed a reduction in the illuminating power; but that he was then opposed by gentlemen who were now in favour of it. The Lord Provost, who spoke very sensibly on the whole subject, deprecated any change being made without the public getting due warning, so that consumers might provide themselves with suitable burners, or any experiments being made which would put the public to expense. The report was sent to the Works Committee, who are to report upon it.

During the past year there has been a decreased output of gas from the works of the Edinburgh and Leith Corporation Gas Commissioners of 16,206,000 cubic feet. The Edinburgh works produced 997,803,000 cubic feet, an increase of 23,366,000 cubic feet as compared with the previous year; and the Leith works produced 369,915,000 cubic feet, a decrease of 39,572,000 cubic feet. The total was 1,367,718,000 cubic feet, as compared with 1,383,924,000 cubic feet in the previous year. That there is an increase in the one case and a decrease in the other is explained, not by any falling off in the consumption in any particular district, but by alterations in the areas attached to the different works, the full districting arrangements not having yet come into force. The figures are not strictly accurate, in respect that they are those for the year from May 1 to April 30 inclusive, whereas the financial year of the Commission is from May 15 to May 15; but the Commissioners themselves publish no other record of their output than the monthly returns of the Engineers, and therefore, taking the same period for each year, the figures given approach as near to accuracy as any that can be obtained. The decreased output of the past year is accounted for on two grounds. In the year previous, the gas was for a long time of lower illuminating power, and more of it was used; and last year the price of it was advanced by 9d. per 1000 cubic feet. But even with the decrease of 16 millions, the position of the Commission compares very favourably with what it was two years ago; because a year ago it was reported that there had been an increase in the output of 144 million cubic feet, and consequently the output for the year just closed was better by 128 million cubic feet than that of the year before last. These figures only deal with the output. The quantity of gas sold is another matter. The unaccounted-for gas reported a year ago amounted to 155 million cubic feet; and the revenue from gas was £229,807. If the past year were to work out the same way, the revenue from gas should be £234,000. But there is no use anticipating, as the correct sum realized will be published soon; and the balance will depend more upon the expenditure than upon the revenue.

The Corporation of Glasgow, in the development of their electric lighting installation, have sanctioned contracts for electrical insulators, electrical storeage batteries, copper strip for electrical conductors, and insulated cables, at a cost estimated at between £11,000 and £12,000. They have also agreed to pay £9103 for a plot of ground at the corner of Waterloo and Main Streets, as a site for their projected electric lighting station. This is not a particularly suitable site, there being few public buildings in the immediate neighbourhood; but I presume it was the best the Corporation could do unless they were prepared to go much further in price. They can scarcely look for doing much business within 500 or 600 yards of the station; and even the thoroughfares they propose to light do not, at any point, come much nearer to it than that. The Corporation have taken over the private adventure of a firm of electric lighting purveyors in the city, at considerable cost; but they do not seem to be going to have the supply all in their own hands. A Kelvinside Electric Lighting Company has sprung into existence, which must be proposing to do business within the Corporation area. The Electric Lighting Committee of the Corporation had before them the other day a letter from the Board of Trade, asking if they had any observations to offer with regard to the financial position of the Company; and the Town Council on Thursday authorized the

Committee to reply that they had no observations to make. The Company is probably started with the intention of squeezing the Corporation into a purchase; but the tenor of their reply would seem to indicate that the Corporation consider they have been sufficiently squeezed already, and that, so long as they hold their own in the centre of the city, they are regardless as to who may prospect the outlying districts. Being an electric lighting venture, there is probably wisdom in this resolution, because the suburbs cannot be expected to make electric lighting a profitable speculation; but it shows one of the weaknesses of a system of lighting, which is not able to cover its whole area, but is obliged to allow others to obtain a footing in it.

The Dundee Gas Commissioners may be said to have this week launched their electric lighting adventure. They met yesterday to consider the offers by contractors to do the work in connection with the installation; and they accepted tenders to the amount of £3112 for the erection of the buildings of the station, and to the amount of £17,330 for the lighting plant. The original estimate of the Committee was from £15,000 to £20,000; so that it has not been very much exceeded. The Commissioners agreed that each department of the work should be given to a different firm. Surely this was an unwise resolution; because, if they had had only one contractor, they could then have held him responsible if any cause for dissatisfaction had arisen. Except for the erection of the buildings, none of the contractors are local firms.

An action against the Dundee Gas Commissioners has been originated in the Court of Session this week, to recover £180, as compensation for damage inflicted upon property by the gas explosion in the Lochee district in January last. The owner of the property says the explosion was caused by one of the Commissioners' workmen, who had been searching for the source of a leakage of gas, entering a dwelling-house with a lamp, and that the leakage was from the Commissioners' main in the thoroughfare, and arose from the fracture of an old and worn-out pipe. The Commissioners' reply is that their workman carried a safety-lamp, and that the explosion was caused by an inmate of the house raking out a fire; and also that they took every means to keep their mains in order, and that if a fracture had occurred, it was owing to the frost.

The hiring-out of gas-cooking appliances by the Corporation, is a flourishing business in Glasgow. In summer there are whole streets where there is scarcely a house in which gas is not used for cooking, in preference to coal. In April, 93 gas-stoves and 141 kitchen-range fittings for burning gas were sent out to consumers by the Gas Department; and at the end of the month between 10,000 and 11,000 such appliances, all the property of the Corporation, were in use. Besides these there are many owned by the occupiers of houses.

CURRENT SALES OF GAS PRODUCTS.

LIVERPOOL, *June* 4.

Sulphate of Ammonia.—The market keeps quiet, but may, on the whole, be said to be a shade steadier. This may be due to the reduced quantities offering, and to less pressure to sell, no doubt in consequence of the approaching holidays and the closing of many works during Whit week. While the influence of nitrate is constantly being put forward, as affecting the sulphate market, it is interesting to note the relative figures at the end of May during the past ten years:—

	1883.	1884.	1885.	1886.	1887.
Sulphate	£17 10 0	£14 2 6	£11 7 6	£11 0 0	£11 10 0
Nitrate	11 0 0	9 7 6	9 10 0	9 0 0	10 0 0
	1888.	**1889.**	**1890.**	**1891.**	**1892.**
Sulphate	£11 15 0	£12 0 0	£11 3 9	£11 0 0	£9 17 6
Nitrate	9 7 6	8 7 6	8 0 0	8 12 6	8 0 0

The quotations for sulphate are about the same as last week. Nitrate is a little easier again—viz., 7s. 10½d. per cwt.

LONDON, *June* 4.

Tar Products.—Buyers of benzol are still shy of the higher prices asked by distillers, though business to a small extent has been done at 1s. 8½d.; but 1s. 10d is being asked by large makers. Fifties do not participate in the advance, and are distinctly neglected; no more than 1s. 4½d. being obtained. Curiously, solvent naphtha is in good demand, and worth nearly as much as 50's benzol. The manufacture of saccharine from toluol has not improved the value of the latter, as, by itself, it is quiet at a less price than solvent naphtha. Anthracene is still somewhat difficult of sale, although it is reported that a stock of "A" quality has realized 10½d. For "B" makes, there seem to be no buyers at the moment. There is more inquiry for naphthalene; and carbolic products are in distinctly better form. Business has been done at: Tar, 10s. to 12s. Pitch, 27s. to 29s. Benzol, 90's, 1s. 8½d.; 50's, 1s. 4½d. Toluol, 1s. 2½d. Solvent naphtha, 1s. 3d. Crude benzol naphtha, 30 per cent., 8d. Creosote, 1d. Naphthalene salts, 20s.; pressed, 45s. Carbolic acid, crude, 60's, 1s. 1d.; 70's, 1s. 4d.; crystals, 5d. Cresol, 8d. Anthracene, 30 per cent., "A" quality, 10½d.; "B" quality, 7½d.

Sulphate of Ammonia.—Business has fallen off during the past week; and the little spurt, from which it was hoped better prices would begin, has disappeared, leaving the market distinctly quiet. Sales have been reported at prices varying from £9 15s. to £9 16s. 9d., less 3¼ per cent.; but the former figure is the outside value to-day. Gas liquor (10-oz.) is quoted at 5s. to 6s. 6d.

COAL TRADE REPORTS.

From Our Own Correspondents.

Lancashire Coal Trade.—Although the month has opened without any actually announced reduction in list rates, the demand for all descriptions of round coal is extremely slow, and the tendency of prices decidedly in favour of buyers. Except in the Manchester district, where the pits are working five days, which is practically full time, it is exceptional where collieries are running more than about nine days to the fortnight; and although this restricted output checks any large accumulations of stocks on the pit banks, considerable quantities accumulate under load in waggons, and to clear these sales are frequently pushed at very moderate figures. The better qualities of round coal, suitable for house-fire purposes, are for the most part fairly well maintaining their price; and still average 12s. for best Wigan Arley, 10s. to 10s. 6d. for Pemberton four feet and second qualities of Arley, and 8s. 6d. to 9s. for common house-fire coals. Common round coals are, however, becoming more and more difficult to move; and both for inland requirements and for shipment, are in exceedingly poor demand. Supplies are plentiful, and to move away quantities special quotations are made; whilst to meet competition for business, concessions upon list rates have frequently to be made, to keep customers together. On inland sales for steam and forge coals, prices do not now average more than 7s. 9d. to 8s. 3d. per ton at the pit mouth; whilst for shipment, there is plenty of steam coal offering at 9s. 3d. per ton—9s. 6d. being only obtained for the very good qualities. Seconds house coal can be bought readily at about 10s. 6d. per ton; and the best qualities at 12s. 6d. per ton, delivered at the ports on the River Mersey. The chief feature of interest in the market just now is the tendency of prices with regard to the supplies of gas coal for the ensuing season, tenders for which are now being sent in. As reported last week, a strong effort is being made to hold on to the prices obtained last year; but the joint meeting of Lancashire and Yorkshire coal owners held at Sheffield last week did not result in any definite agreement in this respect being come to. The Yorkshire coal-owners, on their part, stated that they were strongly determined to hold on to the prices of last year; and the absence of any prospect of a reduction in miners' wages this year was put forward as a reason for thus holding to the prices. If Yorkshire makes no move in the way of reducing miners' wages, Lancashire will have to follow a similar course; but the Lancashire colliery-owners did not seem disposed to bind themselves down to any agreement as to the prices they should quote on tenders, evidently preferring that they should be allowed to have a free hand in this matter. As yet no very large quantity of gas coal has actually been placed. But one or two important contracts have been settled; and it is reported that, in one instance at least, the price was cut down about 6d. per ton upon that realized last year, whilst it is evident that in several other instances there has been some giving way in prices. Generally, however, the tenders that are being sent in are based upon the average prices obtained last year; and where the concessions above referred to have been made, it seems probable that it has been under some special pressure. With regard to engine classes of fuel, the demand is just now fairly good; and prices in most cases are being steadily maintained at late rates. Burgy averages 6s. 3d. to 6s. 9d.; the better qualities of slack, 4s. 9d. to 5s. 3d.; and common sorts, about 3s. 3d. to 3s. 9d. per ton at the pit's mouth.

Scotch Coal Trade.—There is still a good demand for all sorts of coal; and prices have been quite maintained. The miners are reported to be working a little better; but, notwithstanding, stocks do not accumulate. It is not anticipated that there will be any serious trouble with the men this season; the recent reductions having been acquiesced in, and the masters, on their part, being hopeful that prices will be maintained. While shipping orders are still on the increase, a greater demand for home consumption is also reported—coal merchants being evidently anxious to, if possible, lay in stocks. Gas coal is not commanding the prices which it did a year ago. The prices quoted are: Main, 7s. 9d.; ell, 8s. 6d. to 8s. 9d.; splint, 8s. 3d. to 8s. 9d.; and steam, 10s. to 10s. 3d. per ton. The exports again show a very large increase. For the week, the total export was 180,843 tons, an increase over the corresponding week last year of 43,983 tons; and for the year to date 2,842,990 tons, an increase over this period of last year of 403,784 tons.

The Costs of the Hunter Prosecution.—In the minutes presented by the General Purposes Committee at the meeting of the Salford Borough Council last Wednesday, it was stated that, at the last meeting of the Committee, the Town Clerk read the following resolution from the Consultative Committee: "That this Committee, having met, desires that the General Purposes Committee will instruct the Town Clerk as to whether any and what steps should be taken with reference to the bill of costs delivered to Samuel Hunter by the Town Clerk, in pursuance of the agreement of Aug. 7, 1889." The General Purposes Committee thereupon resolved—"That the Town Clerk be instructed not to take any action with respect to the costs delivered by him to Samuel Hunter, in pursuance of the agreement of Aug. 7, 1889, and that the amount be written off." Mr. Mandley announced that, as no satisfactory reason had been given why the bill of costs should not be paid, he should strenuously object to the adoption of the minutes in their present form. In consequence of this, the matter will come up again at the next meeting of the Council.

Extensions at the Sutton-in-Ashfield Gas-Works.—Last Tuesday Major-General H. D. Crosier, R.E., one of the Local Government Board Inspectors, held an inquiry at Sutton-in-Ashfield, in reference to the application of the Local Board for sanction to borrow £6000 for gas-works purposes. The Clerk (Mr. Hibbert) explained the borrowing powers of the Board under their Gas Act of 1878. They had, he said, reached the extent of those powers, having raised £30,313; and the Local Government Board had already sanctioned the borrowing of a further £1000. In answer to the Inspector, it was stated that the quantity of gas made in 1876 was 11,581,000 cubic feet; in 1887, 25,903,000 feet; and in 1891, 26,009,200 feet. The storeage capacity of the works was 48,000 feet; there being three holders. The average daily production was about 70,000 feet; and in the winter months they frequently made 120,000 cubic feet. Mr. C. E. Jones, the Consulting Engineer, proceeded to show how the sum applied for would be expended in the extension of the works; the items including £1250 each for a new holder and tank, £1000 for purifiers, £960 for contingencies, further sums for the extension of mains, which at the present time the Board were unable to carry out owing to want of capital, considering that such work should not be included in current expenditure, and also for the purchase of 1410 yards of land adjoining the present works.

Extensions at the Newport (Mon.) Gas-Works.—A new tank and gasholder are about to be constructed at the Crindan Station of this Company's works to the designs of Mr. Thomas Canning, Assoc. M.Inst.C.E. The first two lifts will be capable of containing a million cubic feet of gas, and additional lifts may, if thought necessary hereafter, be added to double this capacity, or nearly so. The contractor for the tank is Mr. Linton, a well-known local builder.

The Alterations at the Aberdeen Corporation Gas-Works.—Messrs. Henry Balfour and Co., of Leven, have secured from the Aberdeen Corporation the contract to remove an existing gasholder of 80 feet diameter, and to re-erect it in a new tank some distance from the works. It is to be fitted with a system of water-balance, to allow of the pressure being varied from 3½ to 1½ inches as required; the water being lifted by a centrifugal pump, driven by a gas-engine.

The Sittingbourne Local Board and the Water-Works.—The Milton Town Improvement Commissioners have received an offer from the Sittingbourne Local Board of £2000 for the purchase of their share in the present water agreement; this being part of a scheme for acquiring the water-works for the public. The Commissioners are inclined to be bought out at the price named; and the matter has been submitted to the Local Government Board.

The Prevention of Waste of Water at Plymouth.—Since the present Water Engineer of Plymouth (Mr. Sandeman) took over the duties of his office, the consumption of water has been reduced from 5 million gallons to 3½ millions. It appears that he has 19 of Deacon's and 27 of Siemens's meters in use; and these control the supply to 76,000 of the inhabitants. By an inspection of the water-fittings in the town, some prevention of waste has been effected; and another means to circumvent this that has been resorted to, has been the cutting off of the water supply from 8 p.m. until 6 a.m. next morning.

Tampering with a Water-Meter.—At the Widnes Police Court recently, Edmund Gandy was summoned by the Widnes Local Board for unlawfully making certain alterations in his water-meter. The meter was supposed to have burst during the severe frost last winter; and defendant, instead of notifying the Local Board, repaired it himself, by screwing an iron plate on the bottom. He would have had to pay for it being repaired; but the result was there was a considerable waste of water. It was not denied by the witnesses that the meter registered all the water; and therefore no loss had occurred to the Board. The Bench imposed a nominal fine of 5s., with costs.

The National Union of Gas-Workers and General Labourers of Great Britain and Ireland are now holding their third annual conference at Plymouth. The proceedings commenced on Sunday with an outdoor demonstration. A procession was formed on the Hoe at two o'clock, and marched through the principal streets of the town, led by bands of music. Thousands of people accompanied the procession; and much enthusiasm was displayed. An open-air meeting was afterwards held on the North Quay; speeches being delivered from four platforms. In the evening, a crowded meeting at St. James's Hall was addressed by Mr. Cuninghame Graham, M.P., Mr. W. Thorne, Dr. Aveling, Mrs. Aveling, and others. Another meeting was to be held at St. James's Hall last evening. The conference will close to-morrow (Wednesday).

Proposed Purchase of the Fleetwood Gas-Works by the Commissioners.—At the monthly meeting of the Fleetwood Commissioners on the 25th ult., the question of the charges made by the Fleetwood Gas Company was further considered. The matter had been discussed on several previous occasions; and latterly an effort to secure a reduction in price was unsuccessful. Mr. Armour, in dealing with the subject, said that if the town obtained the gas-works from the Company the undertaking would pay for itself in a few years. He was sure that twice the quantity of gas would be used if the price were brought within reach. He pointed out that at Blackpool, where the gas-works are owned by the Corporation, gas is supplied at 2s. 6d. per 1000 cubic feet. He argued that the present was the time for the Commissioners to purchase the undertaking, because in a few years they would probably have to pay double the price. He moved that the Lighting Committee be authorized to confer with the Directors of the Fleetwood Gas Company upon the question of charges for gas, and also to ascertain upon what terms the works could be acquired by the Commissioners. The motion was adopted.

Buenos Ayres (New) Gas Company.—At the annual meeting of this Company to be held to-morrow, the Directors will submit their report on the working of the concern during the year ending Dec. 31 last. They open it by remarking that the result, as shown by the figures in the accounts, is due to the unprecedented depreciation in the value of the currency in which payment for gas is made. The conversion of this currency into sterling has also destroyed the benefits that would otherwise have been derived from the increase in the charge for public and private lighting, which the Directors were able to effect during the year. Notwithstanding that the business of most industrial undertakings trading in the Republic has been very adversely affected by the political and commercial crisis through which the country is passing, the Directors have the satisfaction of reporting that, in the case of this Company, the gross income in currency advanced from $2,067,992 in 1890 to $2,218,493 in 1891—the largest amount in dollars which has been earned in any one year since the formation of the Company, while the private meters fixed have increased from 9557 to 10,151; thereby showing that the business continues steadily to improve. In addition to an increase of 50 per cent. in the charge for public lighting, the Directors have been successful in their efforts to procure the assent of the Municipality to a reduction of the number of public lamps in use—a desirable economy for them to adopt during the present financial pressure. By these arrangements, no material increase has been made in the municipal debt during the year. In order to meet the provisions of a local Act recently passed, imposing a tax on the profits of companies trading in the Argentine Republic, the form of keeping the local accounts as heretofore in a fluctuating currency has been changed, and has now been put on a gold basis. They are now incorporated in the London books at their value in gold, in conformity with the system adopted by other English companies doing business in the Argentine Republic.

The Dewsbury and Heckmondwike Water Board and the Water Supply of Hemsworth.—A letter was read at the meeting of the Dewsbury and Heckmondwike Water Board last Thursday, from the Hemsworth Local Authority, stating that they were not now willing to proceed further with the scheme for receiving a supply of water from the Board, and that a resolution had been passed by them rescinding all previous resolutions on the subject. It was decided not to proceed with the Bill to empower the Board to supply Hemsworth.

Liability for the Bursting of a Water-Pipe.—At the Sheffield County Court last Thursday, his Honour Judge Ellison gave his decision in a case in which Mr. J. A. Bain, a bookseller, of 13, High Street, Sheffield, sued Messrs. Staniforth, Ball, and Co., stockbrokers, of the same premises for £50 damages to his stock-in-trade and other property by reason of their negligence, whereby a water-pipe burst on their part of the premises. Plaintiff's shop is on the ground floor; and defendants occupy the rest of the building, and have a water-closet on the second floor. Last Christmas, a pipe connected with the closet burst; and the water poured into plaintiff's shop. The window of the closet was found open; and this was the ground of negligence alleged. But Mr. Eaton, the Corporation Water Engineer, gave evidence proving that the pipe was completely covered by woodwork casing, and that no portion was freely exposed to the atmosphere. He also stated that the open window would have no material effect in freezing the pipe, and that no artificial heat would have much effect, as the closet was open to the current of the staircase. His Honour said that supposing the defendants knew there was going to be the intense frost on the night of Christmas Day that did occur, it might have been questionable whether there was not some negligence in leaving the window open. But a person could not be held guilty of negligence in a matter as to which he was completely in ignorance. There was no evidence at all as to when the window was opened, or how long it was open. No doubt at the time defendants might have contemplated a frost. Still, he (the Judge) could not see any evidence of negligence, and gave a verdict for defendants. He added, however, that it would be a right thing for them, seeing the damage plaintiff had sustained, not to ask for costs.

GAS AND WATER COMPANIES' STOCK AND SHARE LIST.

For Stock Market Intelligence, see ante, p. 1054.)

Issue.	Share	When ex-Dividend.	Dividend or Div. & Bonus.	NAME	Paid per Share	Closing Prices.	Rise or Fall in Wk.	Yield upon investment.
£			p. c.	GAS COMPANIES.				£ s. d.
590,000	10	13 Apr.	10½	Alliance & Dublin 10 p. c.	10	16½—17½	..	6 0 0
100,000	10	,,	7½	Do. 7 p.c.	10	11—12	..	6 5 0
300,000	100	2 Jan.	5	Australian (Sydney) 5 % Deb.	100	105—107	..	4 13 5
100,000	20	27 May	8	Bahia, Limited	20	10—12*	..	13 6 8
200,000	5	12 May	7½	Bombay, Limited	5	6½—6¾	..	5 11 1
40,000	5	,,	7½	Do. New	4	4½—5	..	6 0 0
380,000	Stck.	26 Feb.	12½	Brentford Consolidated	100	212—217	..	5 12 11
150,000	,,	,,	9½	Do. New	100	162—167	..	5 10 9
220,000	20	11 Mar.	11½	Brighton & Hove Original	20	40—42	..	5 9 6
888,500	Stck.	11 Mar.	5	Bristol	100	95—100	..	5 0 0
320,000	20	13 Apr.	11½	British	20	42—44	..	5 2 3
50,000	10	26 Feb.	11½	Bromley, Ordinary 10 p. c.	10	19—20	..	5 15 0
51,510	10	,,	8½	Do. 7 p. c.	10	15—16	..	5 6 3
328,750	10	,,	—	Buenos Ayres (New) Limited	10	6½—7½	−½	—
200,000	100	2 Jan.	6	Do. 6 p. c. Deb.	100	94—97	..	6 3 9
150,000	20	26 Feb.	8	Cagliari, Limited	20	25—27	..	5 18 6
550,000	Stck.	13 Apr.	13	Commercial, Old Stock	100	229—234	..	5 11 1
165,000	,,	,,	10	Do. New do.	100	180—190	..	5 5 3
130,000	,,	30 Dec.	4½	Do. 4½ p. c. Deb. do.	100	118—123	..	3 13 2
800,000	Stck.	30 Dec.	13	Continental Union, Limited	100	220—225	..	5 15 6
200,000	,,	,,	10	Do. 7 p. c. Pref	100	190—195	..	5 2 7
75,000	Stck.	30 Mar.	10	Crystal Palace District	100	185—195	..	5 2 7
486,090	10	29 Jan.	10	European, Limited	10	19—20	..	5 0 0
354,060	10	,,	10	Do. Partly paid	7½	13½—14½	..	5 3 11
5,470,820	Stck.	12 Feb.	12	Gaslight & Coke, A, Ordinary	100	207—211	..	5 13 9
100,000	,,	,,	4	Do. B, 4 p. c. max.	100	94—98	..	4 1 7
665,000	,,	,,	10	Do. C, D, & E, 10 p.c. Pf.	100	250—255	+2	3 18 5
30,000	,,	,,	5	Do. F, 5 p. c. Prf.	100	118—123	+2	4 1 3
60,000	,,	,,	7½	Do. G, 7½ p. c. do.	100	169—174	..	4 6 2
1,300,000	,,	,,	7	Do. H, 7 p. c. max	100	154—158	..	4 8 7
463,000	,,	,,	10	Do. J, 10 p. c. Prf.	100	247—252	+2	3 19 5
476,000	,,	,,	—	Do. K, 6 p. c. Prf.	100	148—153	+2½	3 18 5
1,061,150	,,	11 Dec.	4	Do. 4 p. c. Deb. Stk.	100	114—117	..	3 8 5
894,850	,,	,,	4½	Do. 4½ p. c. do.	100	118—123	..	3 13 2
908,000	,,	,,	6	Do. 6 p. c. do	100	165—169	..	3 11 0
3,800,000	Stck.	12 May	12	Imperial Continental	100	212—216	−3	5 11 1
75,000	5	26 June	6	Malta & Mediterranean, Ltd.	5	4—4½	..	6 13 4
560,000	100	1 Apr.	5	Met. of Melbourne, 5 p. c. Deb.	100	108—110	..	4 10 11
541,920	20	27 Nov.	5†	Monte Video, Limited	20	14½—15½	..	6 9 0
150,000	5	27 May	10	Oriental, Limited	5	7½—8¼*	..	6 1 2
60,000	5	30 Mar.	7	Ottoman, Limited	5	4—5	..	7 0 0
166,870	10	26 Feb.	2	Pará Limited	10	2—3	..	—
420,000	100	3 May	6	People's Gas of Chicago— 1st Mtg. Bds.	100	104—107	..	5 12 1
500,000	100	1 June	6	2nd Do.	100	100-103*	..	5 16 7
150,000	10	15 Oct.	10	San Paulo, Limited	10	8—9	..	—
500,000	Stck.	26 Feb.	13½	South Metropolitan, A Stock	100	270—275	..	5 12 9
1,350,000	,,	,,	12	Do. B do.	100	217—221	−1	5 8 7
200,000	,,	,,	13	Do. C do.	100	230—240	−2½	5 8 4
725,000	,,	30 Dec.	5	Do. 5 p. c. Deb. Stk.	100	142—146	..	3 8 6
60,000	Stck.	11 Mar.	11½	Tottenham & Edm'nton, "A"	100	225—230	..	5 0 0
				WATER COMPANIES.				
729,331	Stck.	30 Dec.	10	Chelsea, Ordinary	100	252—257	..	3 17 9
1,720,252	Stck.	13 Apr.	8	East London, Ordinary	100	197—202	..	3 19 2
544,440	,,	30 Dec.	4½	Do. 4½ p. c. Deb. Stk.	100	138—142	+2	3 3 4
700,000	50	11 Dec.	8½†	Grand Junction	50	99—103	+1	4 2 6
708,000	Stck.	12 Feb.	10½	Kent	100	260—265	..	3 19 3
1,043,800	100	30 Dec.	9½	Lambeth, 10 p. c. max.	100	220—225	..	4 4 5
406,200	100	,,	7½	Do. 7½ p. c. max.	100	187—192	..	3 18 1
279,700	Stck.	30 Mar.	4	Do. 4 p. c. Deb. Stk.	100	121—124	+1	3 4 6
500,000	100	12 Feb.	12½	New River, New Shares	100	325—335	..	3 22 4
1,000,000	Stck.	29 Jan.	4	Do. 4 p. c. Deb. Stk	100	126—129	..	3 2 0
902,300	Stck.	30 Dec.	6½	S'thwk & V'xhall, 10 p. c. max.	100	148—153	..	4 4 11
126,500	100	,,	6½	Do. D 7½ p. c. do.	100	133—138	..	4 14 3
1,155,066	Stck.	11 Dec.	10	West Middlesex	100	242—246	..	4 1 3

*Ex div.

†Next dividend will be at this rate.

Additions to the Preston Water-Works.—The Preston Town Council, at their last meeting, approved of a report by the Borough Engineer on the water supply of the borough, and also of the recommendation of the Water Committee that the following works should be executed: A 36-inch new iron main from Acregate Lane to the Grimsargh reservoirs, with new straining chambers, &c.; a 36-inch new iron main from the Grimsargh to the Alton reservoir, with new straining chambers, &c.; the construction of a new reservoir of 275 million gallons capacity, and of straining tanks, and the diversion of a portion of the Loud and of the Spade Mill conduits for carrying the water to the reservoirs, at an estimated cost of £95,500; and further that the Council memorialize the Local Government Board for power to borrow this sum.

Exhibitions of Gas Appliances.—An exhibition of the gas-stoves manufactured by Messrs. C. Wilson and Sons, of Leeds, was opened in the crypt of the Middlesbrough Town Hall last Wednesday week. In connection with the exhibition, a series of cookery lectures was given by Miss R. M. Watts, of the Yorkshire School of Cookery; whilst each day fifty loaves of bread were handed over to the Chief Constable for distribution among those who are in distress in consequence of the present dispute in the coal trade. Messrs. R. and A. Main, of Glasgow, held an exhibition of their enamelled steel gas cookers and other appliances, in the Primitive Methodist Church Schools, at Nottingham, from Tuesday to Friday last week. Attractive lectures on cookery were delivered each day by Miss Thompson, of the Nottingham and District School of Cookery. A series of free demonstrations in cookery was given by Miss E. E. Golding, of South Kensington, during the past week at the Albert Hall, Landport—each afternoon being devoted to high-class cookery and the evening to every-day cookery. In connection with the lectures, there was an exhibition of the various gas appliances manufactured by Messrs. Richmond and Co., of London and Warrington. This firm have also recently exhibited at Macclesfield and Ramsgate.

Portsmouth Water Company.—At the half-yearly meeting of this Company last Thursday week, the report submitted by the Directors stated that there was an available balance of £14,681, from which it was recommended that the full statutory dividends should be declared. The Chairman, in proposing the adoption of the report, referred to the proposed purchase of the works by the Corporation. The Directors had, he said, been asked what they would consider to be a fair purchase price. This they had stated; but they had not yet received any further information—the negotiations having been suspended, probably owing to the death of one of the members of the Committee having the matter in hand. If again approached, the Directors would give the matter careful consideration; and the shareholders would be called together for consultation on so important a question. The report was adopted.

Yorkshire and Lancashire Water Gas Company.—In the Chancery Division of the High Court of Justice, Mr. Justice Stirling had before him on the 14th ult., a petition by the Company that the Court would confirm a scheme for an extension of the area of the Yorkshire Water Gas Company and an alteration in the name of the Company. Mr. W. B. Lindley, who appeared for the Company, said it was incorporated on April 30, 1889, with a capital of £151,000, for the purpose of acquiring all rights in certain water-gas patents, with powers to grant licences, for the county of York. It was now desired to extend the Company's operations to Lancashire; and the Company had, therefore, passed resolutions to this effect, which had in due course been confirmed by a later meeting, in terms of the Act. They now came, by their petition, for the sanction of the Court to an alteration in the Memorandum of Association, authorizing the Company to acquire similar rights for Lancashire to those they already had for Yorkshire; and also to sanction the alteration of the name to the Yorkshire and Lancashire Water Gas Company, Limited. The learned Counsel said the assent of the Company's creditors had been obtained. There was no opposition; and his Lordship, therefore, made the required order.

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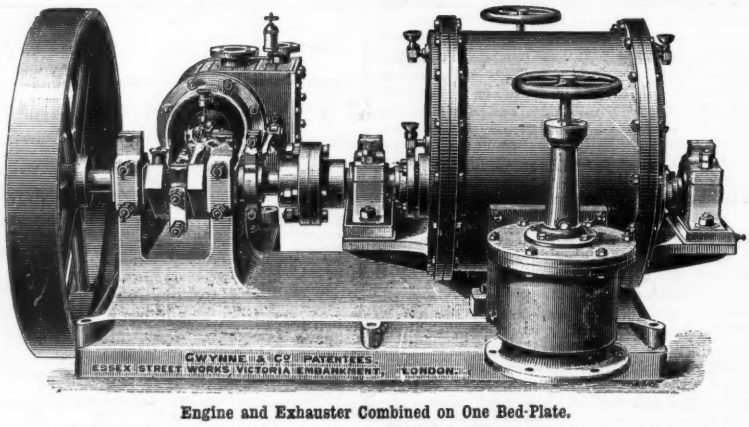

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GAS PURIFICATION AND CHEMICAL COMPANY, LIMITED.

ANDREW STEPHENSON, Agent.
Please address all communications to the Company, as above.

ANDREW STEPHENSON, Agent for BRIN'S OXYGEN COMPANY, Limited, Westminster, S.W.
City Address: 182, Gresham House, Old Broad Street, LONDON, E.C.

WINKELMANN'S "Volcanic" Fire CEMENT. (Fire resistance, 4500° Fahr.)
Prices, particulars, and directions for use on application to ANDREW STEPHENSON, 182, Gresham House, Old Broad Street, LONDON, E.C.

JAMES LAWRIE & CO. supply Best SCOTCH CANNEL COALS, Best FIRE-CLAY RETORTS, BRICKS, TILES, and LUMPS; BOILER SEATING BLOCKS, FLUE COVERS, and SILICA BRICKS for SPECIAL FURNACE WORK; COKE BARROWS, BOGIES, and SMALL WAGONS.
Postal Address: 1, WHITTINGTON AVENUE, E.C.
Telegram Address: "EIRWAL LONDON."

W. C. HOLMES & Co., Huddersfield, AND 80, CANNON STREET, LONDON,
Contractors for Gas-Works complete, Makers of Gasholders, Purifiers, Scrubbers, Condensers, Retort Fittings, &c., Improved Valves, Engines, and Exhausters. Also for Collingwood's Regenerative Retort-Settings.
*** See Advertisement p. 1046 of this week's issue.
Cablegrams: "Ignitor London." Telegrams: "Holmes Huddersfield."

J. & J. BRADDOCK, Globe Meter Works, Oldham.
First-Class Award, Melbourne Exhibition, 1889, for WET AND DRY GAS-METERS, STATION METERS, AND GOVERNORS, PRESSURE-GAUGES, STREET LAMPS AND PILLARS, &c.
Telegraphic Address: "Braddock, Oldham."

IRISH BOG ORE OXIDE OF IRON.

GAS PURIFICATION.

BALE, BAKER, & CO., direct Importers from Ireland. Sample and Price on application.
OXIDE PAINT, SULPHURIC ACID, & Chemicals.
120 and 121, NEWGATE STREET, LONDON, E.C.

OLPHERT'S OXIDE.

FINEST Quality of Natural Bog Ore
Apply for particulars to the Sole Agent, Mr. THOS. L. ARCHER, Cathedral Chambers, Half Street, MANCHESTER.

SULPHURIC ACID.

JOHN NICHOLSON & SONS, Chemical Works, LEEDS, specially produce this ACID from BRIMSTONE, for making SULPHATE OF AMMONIA of high quality and *good* colour. Delivery in our own Railway Tank-Wagons or Carboys. Highest references and all particulars supplied on application.

OIL for the "Wells" or "Lucigen" Lamps.
HARDMAN AND CO., Miles Platting, MANCHESTER.

CANNEL COAL, ETC.

JOHN ROMANS & SON, EDINBURGH.
Gas Engineers, supply all the most approved SCOTTISH CANNELS; also FIRE-CLAY GOODS, CAST-IRON PIPES, and other APPARATUS for GAS AND WATER WORKS.
Prices, &c., will be forwarded on application to No. 80, ST. ANDREW SQUARE, EDINBURGH, NEWTON GRANGE, NEAR DALKEITH, } SCOTLAND.

OXIDE OF IRON FOR GAS PURIFICATION.

JAMES GORDON & Co., Brokers, can offer Cargoes of good quality; also 2500 tons of SPENT OXIDE.
Samples and price on application.
Address Borough Buildings, 7, Rumford Street, LIVERPOOL.

LIQUOR and Tar wanted.
BROTHERTON AND Co., Ammonia and Tar Distillers, LEEDS and WAKEFIELD.

LIQUID FUEL.

TAR Oils, Naphthalene, Oil Residues, Tar, Petroleum, &c. SADLER'S PATENT BURNER is the simplest and most effective. No smoke; no Ashes.
For particulars and price of Burner and Cheap Oils, apply to SADLER AND Co., LIMITED, MIDDLESBROUGH.

SITUATION wanted, by a thorough steady, reliable man, as ENGINE-DRIVER at a Gas or Water Works. First-class references.
Address A. MILNE, Wilnecote, Tamworth.

WANTED, by a competent Gas-Fitter, a situation as SERVICE LAYER, METER FIXER, and INDEX READER. Well up in House Fitting, Gas-Stoves. and work of a Gas-Works.
Address FITTER, 3, Legge Street, Newcastle, STAFFS.

SUPERINTENDENT AND MANAGER OF GAS-WORKS.

THE Rugby Gas Company will, about Michaelmas next, or earlier (if arranged), require a SUPERINTENDENT and MANAGER of their Gas Manufactory Works and Business connected therewith.
Salary £200 per annum, with House, Fuel and Light, and Rates and Taxes free. About 10,000 tons of Coal carbonized. Population about 13,000. Guarantee required.
Applications, in own writing, stating age and, fully and concisely, particulars of experience and employments, with three recent testimonials only, and date (approximately) when duties could be entered upon, to be sent, marked "Application," to the undersigned, on or before June 14.

T. M. WRATISLAW,
Rugby. Secretary.

FOR SALE—From 150 to 180 tons of SPENT OXIDE.
Apply to the MANAGER, Gas-Works, Stretford, near MANCHESTER.

BRUSH SCRUBBER.

FOR SALE, to pass 350,000 cubic feet per 24 hours, in good order. Being removed to make room for apparatus of greater capacity.
Apply to the MANAGER, Gas-Works, KIRKCALDY, Kirkcaldy, N.B.,
June 7, 1892.

GAS-METERS FOR SALE.

THE Royal Agricultural Hall Company, Limited, Islington, have FOR SALE one 500-LIGHT DRY METER, and one 200-LIGHT DRY METER, which until recently have been used at the Hall, and are in good working order.
Apply to R. VENNER, Secretary, Royal Agricultural Hall Company, Limited, ISLINGTON.

PONTYMISTER GAS-WORKS.

FOR SALE—Ten Ω-shaped Mouth-pieces, 17 in. by 13½ in., with Lugs, Cross-Bars, and T-Screws, Ten 4-inch ASCENSION-PIPES, and Ten 4-inch H-PIPES; also Two lengths of 14-inch diameter HYDRAULIC MAIN, each length 8 ft. 8 in., with Ten 4-inch Dip-Pipes fitted complete.
Prices to be sent to

W. D. JONES,
Manager.
June 2, 1892.

FOR SALE, cheap—Two Gasholders 35 ft. diameter by 12 ft. deep. Capacity, 11,500 cubic feet each. Also various other larger sizes.
WASHERS, from 500,000 to 250,000 feet per diem.
CONDENSERS, from 500,000 to 10,000 feet per diem.
EXHAUSTERS, from 120,000 to 5000 feet per hour.
STATION METERS, from 100,000 to 1500 ft. per hour.
Would erect any of the above, and make practically equal to new.
Inquiries invited for any second-hand Gas Plant.
Apply to SAML. WHILE (late Ashmore and While), 60, Queen Victoria Street, LONDON, E.C.

TO GAS COMPANIES AND CORPORATIONS.

THE Dundee Gas Commissioners have FOR SALE two GAS EXHAUSTERS, each capable of passing 50,000 cubic feet per hour.
The Exhausters, which are in excellent condition, are known as Laidlaw's Rotary, and delivery can be given at once.
Price £60 each, free on Rail in Dundee.

JOHN M'CRAE,
May 25, 1892. Engineer.

TUBES.

FOR Gas, Steam, and Water; Galvanized, White Enamelled, and Hydraulic Tubes, &c.
JOHN SPENCER, Globe Tube Works, WEDNESBURY, and 14, Great St. Thomas Apostle, LONDON.

HUTCHINSON BROTHERS, Barnsley, Gas Engineers and Contractors, Makers of Wet and Dry Gas-Meters and General Gas Apparatus, Sulphate of Ammonia Plant, Lead Saturators, Tanks, &c., Tools and Sundries.

JOHN RILEY & SONS, Chemical Manu-facturers, Hapton, near Accrington, are MAKERS of SULPHURIC ACID, from Brimstone, for Sulphate of Ammonia making. Highest percentage of Sulphate of Ammonia obtained from the use of this Vitriol. References given to Gas Companies.

SADLER AND CO., LIMITED, MIDDLESBROUGH; ULVERSTON (BARROW); PORTSMOUTH; CARLTON; STOCKTON; 70, Wellington Street, GLASGOW; 58, Fountain Street, MANCHESTER; and 85, Water Street, NEW YORK. Tar Distillers, Manufacturers of all TAR PRODUCTS, ALIZARINE and other TAR COLOURS, BICHROMES, OXALIC ACID, ALKALIES, LIQUOR AMMONIA, AMMONIA SULPHATE, &c.
Head Office: MIDDLESBROUGH. Correspondence invited.

PORTER & CO., Gowts Bridge Works, LINCOLN, Engineers, Ironfounders, and Contractors, for the erection of Gas-Works for Towns, Villages, Mansions, Manufactories, Collieries, and Isolated Buildings, at home and abroad. Manufacturers of Retorts and Fittings, Condensers, Scrubbers, Purifiers, Valves, &c.; also of Girders, Wrought and Cast Iron Tanks, Iron Roofs, &c.
Telegraphic Address: "PORTER, LINCOLN."

PATENTS, DESIGNS, AND TRADE MARKS.

INVENTIONS Protected by Letters Patent. TRADE MARKS REGISTERED at home and abroad. Advice on all questions relating to above. Handbook gratis.
Apply to J. C. CHAPMAN, Chartered Patent Agent, 70, Chancery Lane, LONDON.

SULPHURIC ACID.

HUGH WALLACE & CO., Chemical Manufacturers (the old-established firm), supply the above, which is specially adapted for making White Sulphate of Ammonia. The latter purchased in any quantity at highest market prices, or contracts for the year.
For prices and terms apply Botolph House, Eastcheap, LONDON, EC.

GASHOLDER AND CONDENSERS FOR SALE.

THE Great Yarmouth Gas Company have FOR DISPOSAL a GASHOLDER, with Cast-Iron Tank complete; also a set of CONDENSERS in good condition.
Further particulars can be obtained on application to the Engineer.

ROCHESTER GASHOLDER.

TO Contractors tendering for this work —A SET OF PRINTS of the four DRAWINGS on view at Rochester may be obtained, price £2 2s., from Mr. T. H. NIXON, Gas-Works, 709a, Old Kent Road, LONDON.

COUNTY BOROUGH OF BURY.

TO COLLIERY PROPRIETORS AND OTHERS.

THE Gas Committee of the Corporation of Bury are prepared to receive TENDERS for the supply of GAS COAL and CANNEL for One, Two, or Three years, commencing on the 1st day of August next, to be delivered in such quantities as may be required from time to time.
Quantity required, 30,000 tons of Coal and 2000 tons of Cannel per annum.
Full Particulars and Form of Tender may be obtained on application to the Engineer, W. H. S. Gendall, at the Gas-Works, Elton, Bury.
Sealed tenders, endorsed "Tender for Coal and Cannel," to be sent to the undersigned on or before Monday, the 20th of June, 1892.

JOHN HASLAM,
Town Clerk.
Corporation Offices, Bury,
June 3, 1892.

TAR AND AMMONIA WATER.

THE Directors of the Loughborough Gas Company are prepared to receive TENDERS for the surplus TAR and AMMONIA WATER to be produced at their Works for One year from the 30th of June, 1892.
The estimated quantity will be about 400 tons of Tar, and 900 tons of Ammonia Water.
The Tar and Liquor to be delivered into the Contractor's Boats at the Wharf on the Derby Road, Loughborough.
The strength of the Liquor to be tested by Twaddel's Hydrometer (temperature 60°), and the tender to state the price per ton, commencing at 4° and up to 8°.
The Boats for the removal of the Tar and Ammonia Water to be sent at such times as may be required.
Payments on the 10th of the following month.
Further information may be obtained on application to the undersigned, to whom tenders, in accordance with this advertisement, must be sent not later than the 21st of June next.
The Directors do not bind themselves to accept the highest or any tender.

J. B. BALL, C.E.,
Manager.
Loughborough,
June 2, 1892.

COZE'S Automatic Apparatus for CHARGING AND DISCHARGING GAS-RETORTS. See Advertisement p. III., centre of JOURNAL.
Inquiries should be addressed to THE AUTOMATIC COAL-GAS RETORT COMPANY, LIMITED, 86-88A, LEADENHALL STREET, E.C.

DRAWINGS, Tracings, Specifications, Quantities, &c., prepared by an experienced Engineering Draughtsman. Plans of Works made, copied, or enlarged. Blue copies made. Illuminated Addresses in first-class style. Writings of all kinds, Engrossments, &c.
Address J. L. FEATHERSTONE, 173, Fentiman Road, LONDON, S.W.

FRIEDRICH LUX, Ludwigshafen am Rhein; and at No. 142, Great Portland Street London, W.
LUX'S Gas Regulators for every consumption.
LUX'S single-stem Pressure-Gauges.
LUX'S Regulator for Gas-Engines.
LUX'S Gas-Balance.
LUX'S new Gas Regulator for Inverted Lamps and other Apparatus for Gas Lighting, &c.

CARBON.

THE Bute Docks Company have for DISPOSAL from 8 to 10 tons of good clean RETORT CARBON.
Apply to S. WARD, Manager, Bute Gas-Works, CARDIFF.

THE Directors of the Camborne Gas Company invite TENDERS for the supply of 1000 tons of best GAS COAL, delivered f.o.b., to the Company's Order, between the 1st of July, 1892, and the 30th of June, 1893.
Sealed tenders, endorsed "Tender for Coal," should be addressed to the Secretary on or before the 18th inst.
The Directors do not bind themselves to accept the lowest or any tender.

W. BAILEY,
Secretary.
Camborne, June 2, 1892.

CORPORATION OF ROTHERHAM.

(GAS DEPARTMENT.)

THE Gas Committee are prepared to receive TENDERS for the supply and delivery of 250 tons of NOTTINGHAM MAIN CANNEL COAL.
Forms of Tender may be obtained on application to Mr. C. B. Newton, Gas Engineer.
Tenders to be sent in to me not later than Monday, the 20th of June, 1892, endorsed "Tender for Cannel."

By order,
H. H. HICKMOTT,
Town Clerk.
Council Hall, Rotherham.

ELLAND-CUM-GREETLAND GAS COMPANY.

ISSUE OF 500 NEW 4½ PER CENT. PREFERENCE SHARES OF £10 EACH.

THE Elland-cum-Greetland Gas Com-pany offer FOR SALE BY TENDER, pursuant to the provisions of the Elland Gas Order, 1878, on the 17th day of June, 1892, in lots of Ten Shares each, 500 NEW PREFERENCE SHARES of £10 each, bearing a fixed Preferential Dividend of 4½ per cent. per annum, contingent upon and payable out of the profits of each year. A deposit of 10 per cent. upon the purchase-money will be payable within a week after the acceptance of any tender; and the balance of purchase-money will be payable at the end of Two calendar months from the date of such acceptance.
Any Premiums on this issue will not be considered profits, but will be expended in extending or improving the Works, or in paying off borrowed Money.
The Company was incorporated by the Elland Gas Act, 1861, with an authorized Capital of £35,000. Such Capital now consists of £99 £3 per cent. Preference Shares of £10 each; 300 £5 per cent. Preference Shares of £10 each; and 2501 Ordinary Shares of £10 each, the standard rate of Dividend upon which is 10 per cent. per annum. By the Elland Gas Order, 1878, the Company was authorized to raise the Additional Share Capital of £25,000. Of this amount £5263 15s. has been raised by the issue of 500 like Shares to those now offered.
The maximum rates of Dividend upon the Ordinary Shares have been paid since the Act of 1861 down to the date of the Gas Order, and since that time have been increased, now amounting to 12 per cent. With gas at its present price, the Company is authorized to pay a Dividend on its Ordinary Shares of 14 per cent.
The Company have raised loan Capital amounting to £11,750, and have a Reserve Fund amounting to £6750, and an Insurance Fund amounting to £2000. These funds greatly exceed the average amounts of similar funds formed by Gas Companies with the same amount of Capital. The new Capital is required to extend the Company's Works.
The Shares now offered rank after the existing Preference Capital amounting to £9930, created under the Act of 1861, and equally with the 500 New Preference Shares already issued; and all New Preference Shares to be issued under the Order of 1878, but in priority to the Ordinary Shares, will be entitled to Dividend on and after the 1st of September next.
The Acts of Parliament of the Company, and their published statements of account, may be inspected, and copies of these particulars and conditions of sale and any further information may be obtained on application to Mr. Robert Porter, Engineer and Secretary of the Company, Gas-Works, Elland, Yorks.; or to the undersigned Solicitors of the Company.
Sealed Tenders for lots of ten shares each, to be forwarded to the Secretary, not later than the 16th of June next. The Sale will be subject to a reserved price per lot, notice of which will be sent to the Board of Trade before the Tenders are opened.

LANCASTER AND WRIGHT,
Solicitors.
10, Piccadilly, Bradford,
May 9, 1892.

MESSRS. DEBENHAM, TEWSON, FARMER, and BRIDGEWATER'S MONTHLY LIST of Shops, Show-Rooms, Factories, and Waterside Premises, suitable for the Exhibition and Manufacture of Engineering and other Appliances, may be obtained, free of charge, at their Offices, 80, CHEAPSIDE, E.C.

COLNE AND MARSDEN LOCAL BOARD.

(GAS DEPARTMENT.)

THE Gas Committee invite Tenders for the supply of 8000 tons of best screened GAS COAL for the ensuing year.

Schedule of monthly quantities can be obtained from the Engineer, to whom tenders must be sent on or before June 16 inst.

HY. SIMMONDS,
Engineer and Manager.

Gas-Works, Colne,
May 31, 1892

COLNE AND MARSDEN LOCAL BOARD.

(GAS DEPARTMENT.)

THE Gas Committee invite Tenders for the surplus TAR and LIQUOR produced at their Works, for Nine months, ending March 25, 1893.

Tenders to be sent to the undersigned on or before June 16 inst.

HY. SIMMONDS,
Engineer and Manager.

Gas-Works, Colne,
May 31, 1892.

THE Hindley Local Board are prepared to receive TENDERS for the purchase of the TAR and AMMONIACAL LIQUOR produced at their Gas-Works during the ensuing Twelve months.

Full Particulars, with Form of Tender, can be obtained on application to Mr. William Dickinson, Gas and Water Manager.

Sealed tenders, endorsed "Tender for Tar, &c.," to be lodged with the undersigned not later than Monday, June 20, 1892.

By order,
STEPHEN HOLT,
Clerk to the Local Board.

Offices: Cross Street, Hindley,
June 1, 1892.

COUNTY BOROUGH OF STOCKPORT.

(GAS DEPARTMENT.)

TENDERS FOR TAR AND AMMONIACAL LIQUOR.

THE Gas Committee invite Tenders for the purchase of the surplus TAR and the whole of the AMMONIACAL LIQUOR produced at their Works for a period of One, Two, or Three years, commencing on the 1st of July, 1892.

Particulars as to quantity and conditions of contract may be obtained on application to the Engineer, Mr. S. Meunier, Stockport.

Tenders, endorsed with the subject of Tender, and addressed to the Chairman of the Gas Committee, must be sent in on or before Thursday, the 16th of June, 1892.

The Committee do not bind themselves to accept the highest or any tender.

By order,
WALTER HYDE,
Town Clerk.

Stockport, May 31, 1892.

COUNTY BOROUGH OF STOCKPORT.

(GAS DEPARTMENT.)

RETORT MOUTHPIECES.

THE Gas Committee are prepared to receive TENDERS for the supply of 42 MOUTHPIECES (○-shaped), 23 in. by 17 in., with patent Lids, for their Portwood Works.

Any further information and particulars may be obtained on application to the Engineer, Mr. S. Meunier, Stockport.

Tenders, endorsed "Tender for Mouthpieces," and addressed to the Chairman of the Gas Committee, must be sent in on or before Thursday, the 16th of June, 1892.

The resolution of the Council that Contractors will be expected to pay the average rate of wages paid in the district will apply to this contract.

The Committee do not bind themselves to accept the lowest or any tender.

By order,
WALTER HYDE,
Town Clerk.

Stockport, May 31, 1892.

COUNTY BOROUGH OF STOCKPORT.

(GAS DEPARTMENT.)

TO COLLIERY OWNERS AND OTHERS.

THE Gas Committee are prepared to receive TENDERS for the supply of CANNEL and COAL for a period of One, Two, or Three years, commencing on the 1st of July next.

Forms of Tender and Specification, together with any furthur information, may be obtained from the Engineer, Mr. S. Meunier, Stockport.

No form of tender other than that issued by the Committee will be entertained.

Tenders, stating price per ton delivered at the Railway Stations, Stockport, endorsed "Tender for Cannel or Coal," and addressed to the Chairman of the Gas Committee, must be sent in on or before Thursday, the 16th of June, 1892.

The resolution of the Council that Contractors will be expected to pay the average rate of wages paid in the district will apply to these contracts.

The Committee reserve the right to accept tenders for the whole or any portion of any quantity offered, and do not bind themselves to accept the lowest or any tender.

By order,
WALTER HYDE,
Town Clerk.

Stockport, May 31, 1892.

HORNCASTLE LOCAL BOARD.

THE Board are prepared to receive TENDERS for the execution of certain ALTERATIONS proposed to be made at their GAS-WORKS at Horncastle.

A Plan of the alterations may be seen at the Office on the Works, and every information had of the Manager.

Sealed tenders to be sent in, on or before the 14th of June next, to Mr. John Panton, Chairman of the Board, marked "Alterations at Gas-Works."

The Board do not bind themselves to accept the lowest or any tender.

By order of the Board,
CHARLES DEE,
Clerk.

Horncastle, May 30, 1892.

BOROUGH OF MACCLESFIELD.

THE Gas Committee are prepared to receive TENDERS for the supply of the whole or part of 10,000 tons of the best Screened GAS COALS, and 3000 tons of CANNEL, to be delivered free at Macclesfield, at such times and in such quantities as shall be ordered. Deliveries to commence on the 1st of July, 1892, and to be completed within a year.

Tenders, sealed and endorsed, to be sent in not later than Saturday, the 11th day of June, 1892, addressed to the Chairman, Gas Committee, Town Hall, Macclesfield.

The Committee do not pledge themselves to accept the lowest or any tender.

W. FREDK. TAYLOR,
Town Clerk.

May 30, 1892.

SHREWSBURY GASLIGHT COMPANY.

TENDERS FOR COAL.

THE Directors of the Shrewsbury Gas-light Company invite TENDERS for the supply of about 13,000 tons of screened GAS COALS, and about 1000 tons of good English CANNEL, to be delivered free at the Great Western or London and North-Western Goods Yard, Shrewsbury, during the year commencing July 1, 1892, and ending June 30, 1893.

The Directors reserve to themselves the right to divide the quantity into two or more Contracts, and do not bind themselves to accept the lowest or any tender.

Tenders must be made on Forms (containing further particulars), which may be obtained on application at the Company's Works, or by post, and must be sent to the undersigned, on or before the 17th day of June, 1892.

By order,
WM. BELTON, Assoc.M.Inst.C.E.,
Secretary and Manager.

Gas-Works, Shrewsbury,
May 18, 1892.

SHREWSBURY GASLIGHT COMPANY.

DISPOSAL OF SURPLUS TAR.

THE Directors of the above Company are desirous of receiving TENDERS for the purchase of the surplus TAR made at their Works during the year commencing July 1, 1892.

The estimated quantity for disposal is about 950 tons per annum.

Tenders must be made on Forms (containing further particulars), which may be obtained on application at the Company's Works, or by post, and must be sent in to the undersigned not later than the 17th day of June, 1892.

The Directors do not bind themselves to accept the highest or any tender.

By order,
WM. BELTON, Assoc.M.Inst.C.E.,
Secretary and Manager.

Gas-Works, Shrewsbury,
May 18, 1892.

COUNTY BOROUGH OF HUDDERSFIELD.

(GAS DEPARTMENT.)

CONDENSER.

THE Gas Committee are prepared to receive TENDERS for the construction of a WROUGHT-IRON TUBULAR WATER CONDENSER, to be erected in an existing overhead Tank, at the Leeds Road Works.

Full Particulars and Specifications may be had upon application to the Engineer, and Drawings inspected at his Office.

Tenders to be addressed and delivered to Mr. W. R. Herring, Engineer and Manager, Gas-Works, Leeds Road, on or before Wednesday, the 15th of June next, endorsed "Tender for Condenser."

By order,
H. BARBER,
Town Clerk.

Town Hall, Huddersfield,
May 23, 1892.

ALTRINCHAM GAS COMPANY.

COAL AND CANNEL CONTRACTS.

TENDERS are invited for best Screened GAS COAL and CANNEL for One, Two, or Three years from the 1st of July next.

Estimated quantities required each year: Coal, 6500 tons; Cannel, 4500 tons.

Deliveries to be free at Altrincham Railway Station as required.

Sealed tenders, endorsed "Tender for Coal and Cannel," stating the description of both, the pits from which they are to be raised, the amount proposed to be supplied, and cash terms for monthly payments, to be sent addressed to the undersigned, so as to be received not later than Twelve o'clock noon on Tuesday, the 14th day of June next.

The Directors do not bind themselves to accept the lowest or any tender; but the person or persons whose tender may be accepted will be required to execute an agreement for the due performance thereof.

No special form of tender is required.

F. R. B. LINDSELL,
Secretary.

Gas Offices, Moss Lane, Altrincham,
May 30, 1892.

TO COAL MERCHANTS.

THE Kineton Gaslight, Coal, and Coke Company, Limited, invite TENDERS for 300 tons of GAS COAL, delivered into their Works between July 1, 1892, and June 30, 1893.

Sealed tenders to be sent to me, endorsed "Tender for Gas Coal," on or before June 21 inst.

GEO. LINES,
Secretary.

TO TAR AND LIQUOR DISTILLERS.

THE Directors of the Guildford Gaslight and Coke Company are prepared to receive TENDERS for their Surplus TAR and LIQUOR for the year ending June 30, 1893.

Quantity of Coal and Cannel carbonized, about 9500 tons.

Tenders to state price per cask of 40 gallons, and in matter of Liquor to state price per cask of 4° and upwards. Carriage to and from Railway Station, Guildford, free.

Tenders, properly endorsed, and addressed to the Chairman of Directors, Gas Company, Guildford, must be delivered on or before Wednesday, June 22 inst.

By order,
WILLIAM LONGWORTH,
Secretary.

Gas Offices, Guildford,
June 4, 1892.

CORPORATION OF LANCASTER.

(GAS DEPARTMENT.)

TENDERS FOR GAS COAL AND CANNEL.

THE Gas Committee are prepared to receive TENDERS for the supply of about 11,000 tons of screened GAS COAL and 5000 tons CANNEL per annum, delivered on the Gas-Works Siding, Lancaster, in such quantities and at such times as may be required during a period of One, Two, Three, or Five years, commencing delivery Aug. 1 next.

Sealed tenders, endorsed "Gas Coal," giving full particulars of the Coal offered, must be sent to Thom. Swainson, Esq., Town Clerk, Lancaster, on or before the 20th day of June next.

Forms of Tender may be obtained on application to the undersigned.

The lowest or any tender not necessarily accepted.

C. ARMITAGE,
Manager.

Gas-Works, Lancaster,
May 27, 1892.

HORSHAM GAS COMPANY, LIMITED.

TENDERS FOR COAL AND CANNEL.

THE Directors of the Horsham Gas Company, Limited, invite TENDERS for the supply of about 3000 tons of SOUTH YORKSHIRE DOUBLE SCREENED GAS COAL, and about 150 tons of WELL-SCREENED CANNEL, producing about 11,000 cubic feet of 30-candle Gas per ton, and a good saleable Coke.

Both Coals must be free from Bats and Sulphurous Pyrites, or other objectionable matter.

Tenders, stating the price per ton of 20 cwt., delivered free in the Goods Yard, Horsham Station, to be sent to me, the undersigned, on or before Friday, the 10th of June, 1892, and endorsed "Tender for Coal and Cannel."

The Directors do not bind themselves to accept the lowest or any tender.

E. D. SAPEY,
Manager.

Gas Offices, Horsham,
May 18, 1892.

MALDON GASLIGHT COMPANY, LIMITED.

THE Directors of the above Company are prepared to receive TENDERS for the undermentioned Works.

Plans and Specifications may be seen at the Offices of the Company, Maldon, Essex, or at the Office of the Engineers, Messrs. Stevenson and Burstal, 38, Parliament Street, Westminster, on and after Monday, the 13th of June, from Ten a.m. to Five p.m. (Saturday One p.m.).

Sealed tenders to be sent in by Noon of Monday, the 20th of June, addressed to H. Clarke, Esq., Gas-Works, Maldon, Essex.

Charge for Schedule of Quantities Ten Shillings each contract, to be returned on receipt of *bonâ fide* tender.

CONTRACT No. 1.

Providing and laying CAST-IRON MAIN PIPES and APPENDAGES, and removing and relaying existing Pipes.

CONTRACT No. 2.

ALTERATIONS to existing GAS-WORKS—comprising Condenser, Washer, Purifiers, Connecting-Pipes, Station Meter, and other Works.

STEVENSON AND BURSTAL,
Engineers.

NORTH BIERLEY GAS COMPANY.

TENDERS FOR GAS COAL.

THE Directors of the above Company invite TENDERS for the supply of 8500 tons of best screened GAS COAL for One year, from the 1st day of July next, to be delivered at the Low Moor Station, Lancashire and Yorkshire Railway, and in such weekly quantities as will be required by the Company.

Further particulars may be obtained of the Company's Manager, Mr. Robt. G. Shadbolt.

Sealed tenders, endorsed "Tender for Coal," specifying the description and quality of the Coal, to be addressed to the Chairman, Gas Offices, Oakenshaw, near Bradford, and delivered not later than Wednesday the 22nd day of June inst.

The Directors reserve to themselves the right to accept the whole or any portion of any quantity offered and do not bind themselves to accept the lowest or any tender.

By order,
EPM. SUCKSMITH,
Secretary.

Gas-Works, Oakenshaw, near
Bradford

EVESHAM CORPORATION.

(GAS DEPARTMENT.)

THE Gas Committee are prepared to receive TENDERS for the supply of 1000 to 1700 tons of screened GAS COAL, delivered free at Evesham Railway Station, during the Twelve months ending June 30, 1893, at such times and in such quantities as the Manager may direct.

Tenders, specifying the description of the Coal, to be sent to me on or before the 18th of June inst.

THOS. COX,
Town Clerk.

Evesham, June 3, 1892.

LEIGH LOCAL BOARD.

THE Gas Committee of the Leigh Local Board invite TENDERS for the supply of GAS COAL or NUTS for a period of One year, commencing on the 1st of July next.

The quantity required is 8000 tons.

Specification and all particulars may be had from the undersigned.

Sealed tenders, endorsed "Coal," and addressed to Jas. Thorp, Esq., Chairman, to be delivered at the Town Hall, Leigh, not later than Monday, the 20th of June next.

The lowest or any tender not necessarily accepted.

ALFRED T. FLETCHER,
Engineer and Manager.

Gas-Works, Leigh, Lancs.,
June 3, 1892.

TENDERS FOR GAS COAL.

THE Corporation of the Borough of Batley are prepared to receive TENDERS for the supply and delivery at their Gas-Works of 14,000 tons of GAS COAL.

Conditions and Forms of Tender may be obtained on application to the Manager of the Gas-Works.

Sealed tenders, addressed to me, and endorsed "Gas Coal," to be delivered at my Office by Noon on Monday, the 20th of June inst.

The Corporation do not bind themselves to accept the lowest or any tender, and may accept any tender for a part only of the specified quantity.

JOSEPH HANSON CRAIK,
Town Clerk.

Town Clerk's Office, Batley,
June 3, 1892.

TAMWORTH GASLIGHT AND COKE COMPANY.

TENDERS FOR TAR AND AMMONIACAL LIQUOR.

THE Directors of the above Company are prepared to receive TENDERS fo the purchase of the surplus TAR and AMMONIACAL LIQUOR, produced at their Works during a period of Two years commencing from June 24, 1892.

Tenders must be sent to the Chairman of the Company, 23, George Street, Tamworth, on or before Monday, June 20 next.

WILLIAM ARNOLD,
Secretary.

Gas-Works, Tamworth,
May 27, 1892.

PETERBOROUGH GAS COMPANY.

TENDERS FOR COAL.

THE Directors of the above Company invite TENDERS for the supply of best screened GAS COAL and NUTS, for One Year, commencing the 1st of July next.

Form of Tender and Conditions may be obtained on application to the undersigned.

Tenders to be sent in by the 14th of June, 1892, endorsed "Coal," and addressed to the Chairman of the Company.

The Directors do not bind themselves to accept the lowest or any tender.

JOHN BARTON,
Secretary and Manager.

Gas-Works, New Road,
Peterborough, May 28, 1892.

TENDERS FOR GAS COAL.

THE Directors of the Victoria New-market Gaslight and Coke Company, Limited, invite TENDERS for the supply of 4500 tons of best screened GAS COAL during the ensuing Twelve months, ending June 30, 1893.

Tenders, stating price per ton, delivered free at Newmarket Station as required, to be sent on or before June 11, 1892, to the undersigned, from whom any further particulars may be obtained.

The Directors do not bind themselves to accept the lowest or any tender

By order,
J. H. TROUGHTON,
Manager and Secretary.

Gas-Works, Newmarket,
May 28, 1892.

CORPORATION OF LEICESTER.

COAL TENDERS.

THE Gas Committee of the above Corporation are prepared to receive TENDERS for the supply of COALS, COBBLES, or NUTS (about 110,000 tons per annum) for One, Two, or Three years, ending May 31.

Particulars and Form of Tender can be obtained on application to the Engineer.

Tenders, addressed to Alderman Lennard, Chairman, and endorsed "Tender for Gas Coal," to be delivered at these Offices not later than Eleven o'clock a.m., on Saturday, the 18th of June.

The Committee do not bind themselves to accept the owest or any tender.

ALFRED COLSON, M. Inst. C.E.,
Engineer and Manager.

Gas Offices, Millstone Lane,
Leicester, June 7, 1892.

THE INCORPORATED

Gas Institute.

THE TWENTY-NINTH

ANNUAL GENERAL MEETING

OF THE MEMBERS

WILL BE HELD ON

Tuesday, Wednesday, and Thursday,

the 14th, 15th, and 16th of June, 1892,

AT

THE INSTITUTION OF CIVIL ENGINEERS,

25, GREAT GEORGE STREET, WESTMINSTER.

THE CHAIR WILL BE TAKEN BY THE PRESIDENT,

WILLIAM A. VALON, Esq.

Order of Proceedings.

TUESDAY, 14th JUNE.

The Chair will be taken at 11 a.m.

Confirmation of Minutes of last Annual General Meeting. Appointment of Scrutineers to examine the balloting lists for the election of Officers, New Members, &c.

Presentation of Annual Report of Council, and of Statement of Accounts.

Presentation of the Birmingham Medal.

Presentation of Premiums for Papers.

ADDRESS by the President.

(Adjournment for Luncheon.)

Reading and Discussion of Papers and Communications.

[The Annual General Meeting of Donors and Subscribers to the Benevolent Fund will take place at the close of the sitting at 5 o'clock p.m. It is especially requested that contributors will endeavour to attend, in order to secure the quorum required by the Rules.]

WEDNESDAY, 15th JUNE.

The Chair will be taken at 10 a.m.

In Commemoration of WILLIAM MURDOCH and the Centenary of Gas Lighting, a "Murdoch" Lecture will be given by Professor Vivian B. Lewes, of the Royal Naval College, Greenwich. Subject: "A Century of Work on the Development of Light from Coal Gas."

Reading and Discussion of Papers and Communications.

(Adjournment for Luncheon.)

Reading and Discussion of Papers and Communications continued.

The sitting will close at 4.30 p.m.

[EVENING—A Reception will be given in the Westminster Town Hall, by the President, to commence at 8 p.m., and to be followed by a Conversazione and Dance.]

THURSDAY, 16th JUNE.

The Chair will be taken at 10 a.m.

Reading and Discussion of Papers and Communications.

(Adjournment for Luncheon.)

Report of the Scrutineers. Applications for Transference. Nomination of the President of the Société Technique du Gaz en France for election as an Honorary Member. Place of next Meeting. Votes of Thanks.

[By kind invitation of Mr. George F. L. Foulger, members desirous of inspecting the Distributing System of The Gaslight and Coke Company will be able to visit the Goswell Road Station on production of their Cards of Membership.]

List of Papers.

The order in which the Papers are to be read will be determined by the Council prior to the Meeting, so as to suit the general convenience.

"On the Structural Capacity and Cost of Gas-Works." By WILLIAM R. CHESTER, of Nottingham.

"On Steam applied as an Aid to the Revivification of Oxide of Iron *in situ*." By F. G. DEXTER, of Winchester.

"On some Analyses and Lighting Values of English Coal Gas made during 1891." By WILLIAM FOSTER, M.A., Professor of Chemistry, Middlesex Hospital, London.

"On Cantilevers and Cantilever Gasholders." By WILLIAM GADD, of Manchester.

"Notes on the Carburetting of Gases." By Professor VIVIAN B. LEWES, of the Royal Naval College, Greenwich.

"Difficulties in Tank Construction (Second Paper)." By THOMAS NEWBIGGING, of Manchester.

"On the Influence of Combustible Diluents on Illuminating Gases." By Dr. L. T. THORNE, of London.

"On Vertical Standards for Gasholder Framing." By ARTHUR T. WALMISLEY, of London.

In addition to the above, Professor LEWES will, on the morning of Wednesday, 15th June, give a Lecture, entitled, "A Century of Work on the Development of Light from Coal Gas."

ON FRIDAY, 17th JUNE,

There will be an Excursion to Windsor by Special Train leaving Waterloo at 8.50 a.m. 12.30 p.m.—Luncheon at the Town Hall. 2.0 p.m.—Leave Thames Side for trip up the River by Steam Launch, returning to Windsor about 5. 5.30 p.m.—High Tea at the Town Hall. 6.45 p.m.—Leave Windsor Station (S.W.R.) for Waterloo. Tickets, to include return Railway Fare, Luncheon (Wines not included), River Trip, and Tea, 11s. each. In order to make adequate provision, it is absolutely necessary that members should obtain their tickets (at the Offices of the Institute, 3, Victoria Street, S.W.) not later than Wednesday, 15th June.

The Incorporated Gas Institute.

BENEVOLENT FUND.

The Annual General Meeting of the Donors and Subscribers to the Benevolent Fund will be held on Tuesday, 14th June, at 5 o'clock p.m.

Presentation of Report and Accounts.
General Business.

W. H. HARVEY, Secretary.

3, Victoria Street, Westminster, S.W.,
May 30, 1892.

DUKINFIELD LOCAL BOARD.

TENDERS FOR CANNEL AND COAL.

THE above Board invite Tenders for CANNEL and COAL by Tuesday noon, the 21st inst.

For Specification and Forms of Tender, apply to

HARRISON VEEVERS,
Engineer.

Dukinfield,
June 1, 1892.

MANSFIELD CORPORATION.

(GAS DEPARTMENT.)

THE Gas Committee invite Tenders for their surplus TAR for One year ending on the 30th of June, 1893.

The Tar to be removed by the Contractor when required by the Manager.

Monthly payments to be made.

The Committee do not bind themselves to accept the highest or any tender.

Tenders to be sent in, on or before the 25th day of June, 1892, endorsed "Tender for Tar," and addressed to

R. J. PARSONS,
Town Clerk.

Mansfield, June 1, 1892.

BOROUGH OF CHORLEY.

TO GAS ENGINEERS AND OTHERS.

THE Chorley Corporation invite TENDERS for the supply and fixing of six ANNULAR CONDENSERS at the Chorley Gas-Works according to a Specification, copies of which may be obtained on application to the undersigned.

The Corporation do not bind themselves to accept the lowest or any tender.

Tenders, endorsed "Condensers," to be sent to me on or before Monday, the 20th day of June, 1892.

By order,
THOS. A. JACKSON,
Town Clerk.

Town Hall, Chorley.

THE GASLIGHT AND COKE COMPANY.

NOTICE is hereby given, that the TRANSFER BOOKS of this Company, so far as they relate to the DEBENTURE STOCKS AND BONDS, WILL BE CLOSED on the Evening of Friday, the 10th of June next, for the Half Year ending on the 30th of June, 1892, and that the Interest for that Half Year will be payable on the 1st of July next, to the Proprietors registered as the holders of such Debenture Stocks and Bonds at the time of such closing of the Transfer Books, which will be RE-OPENED for the following Half Year on the Morning of Saturday, the 11th of June next.

By order,
JOHN ORWELL PHILLIPS,
Secretary and General Manager.

Chief Office: Horseferry Road,
Westminster, S.W., May 30, 1892.

BROMLEY GAS CONSUMERS' COMPANY.

ADDITIONAL CAPITAL.

MINIMUM PRICE £15 2s. 6d. PER SHARE.

NOTICE is hereby given, that under the powers conferred by the Bromley Gas Act, 1879 the Directors are prepared to receive TENDERS for the purchase of 400 ORDINARY SHARES, of the nominal value of £10 each, in lots not being less than five of such Shares, and at prices not being less than the minimum of £15 2s. 6d. per Share.

The Dividend for the last Twelve months on this class of Shares has been 8½ per cent.

The Shares tendered for will be entitled to a standard Dividend not exceeding 7 per cent., subject to variation in accordance with a Sliding Scale, as in the said Act is provided.

Conditions of Sale and Forms of Tender may be obtained upon application to the Secretary of the Company, at the Works, Bromley, Kent, or of Messrs. Willett and Latter, Market Square, Bromley, Kent.

Tenders must be sent in not later than Thursday, the 23rd day of June, 1892, at Three o'clock p.m., addressed to the undersigned, at the Company's Works, Bromley, Kent.

HENRY W. AMOS, Secretary.

Bromley, Kent, May 21, 1892.

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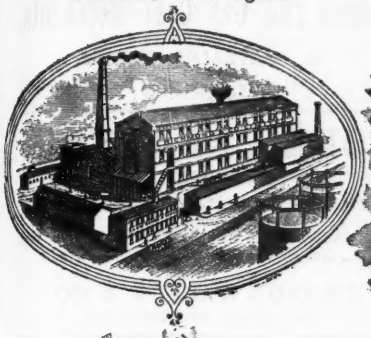

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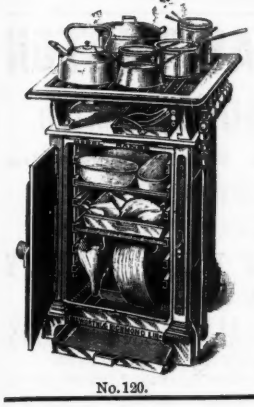

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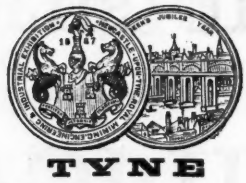

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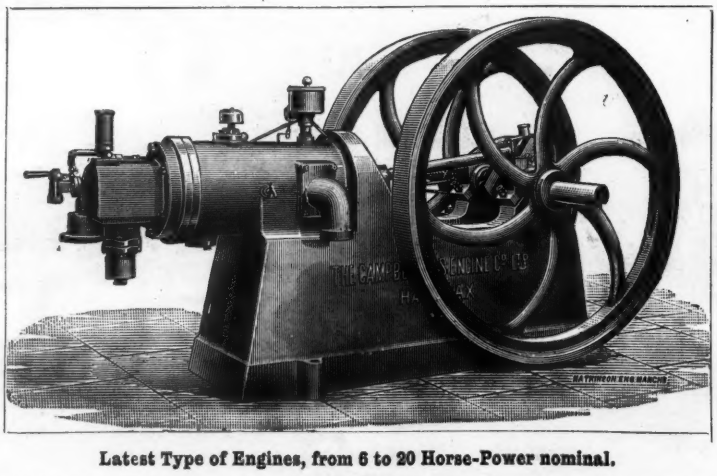

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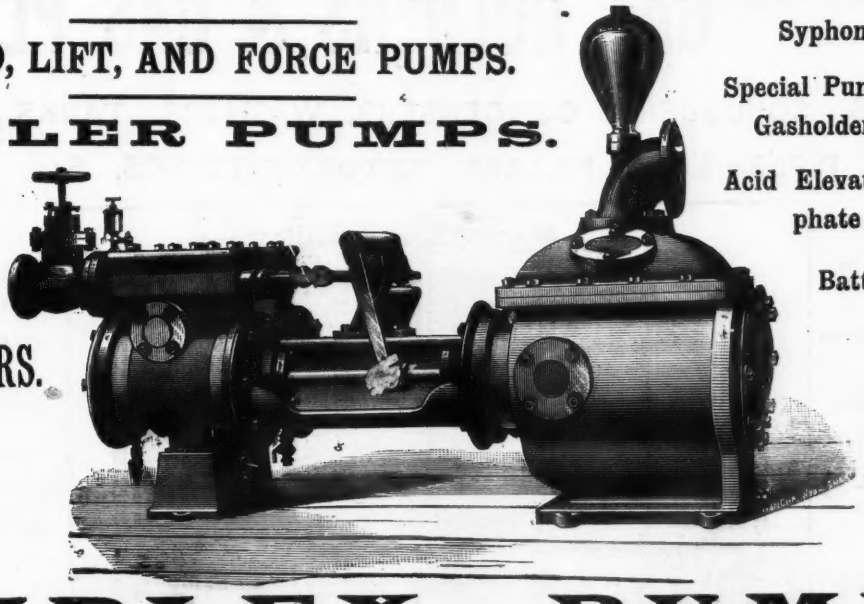

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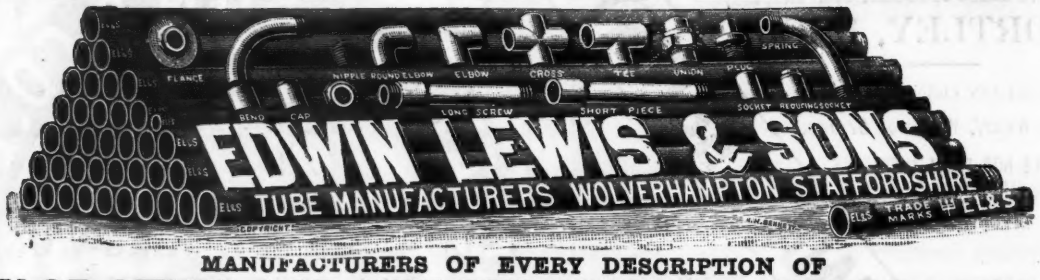

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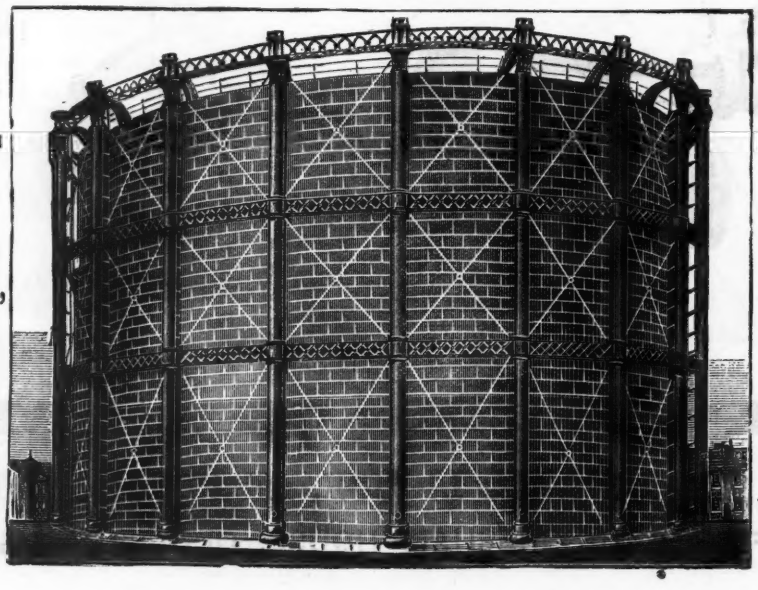

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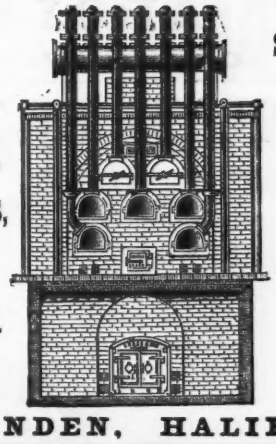

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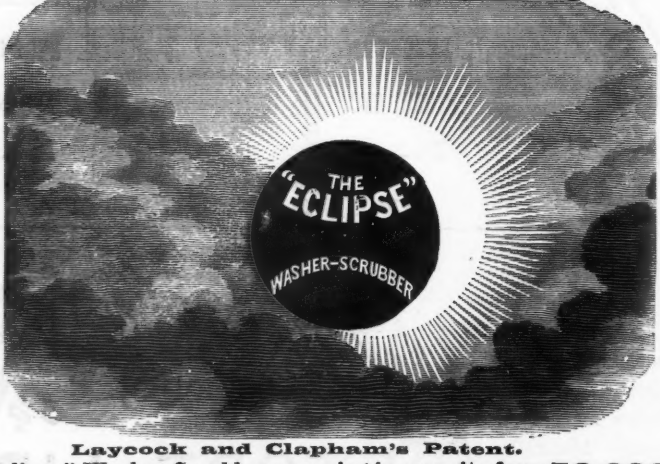

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